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EARLY HANDLING AND GROUP HOUSING: EFFECT ON DEVELOPMENT AND RESPONSE TO STRESS IN THE RAT

G. WINOKUR, M.D., J. STERN, Ph.D. and R. TAYLOR, B.S.*†

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THE effect of gentling or handling on the young rat has been noted to be significant in terms of its later physical development and its ability to tolerate stressful situations. WEININGER found that gentled animals showed a significant increase in body weight and skeletal length over non-gentled animals. The latter, in response to the stress of immobilization developed significantly heavier adrenals and more bleeding points in the stomach and duodenum (WEININGER, 1954, 1956). LEVINE (1957) similarly noted that early handling was an important factor, in that adrenal weights of non-handled animals were greater than that of handled animals after both groups had been given 20% glucose solution and kept from water for 24 hr. The present study attempts to confirm the findings of Weininger under conditions of group as compared to individual housing of animals. The data presented by RUEGAMER and SILVERMAN (1956) are suggestive of a differential effect as a function of the housing variable. Although they obtained significant differences for both individually and group housed (pair housed) animals the level of significance was lower and the number of significant differentiations from control animals were fewer in the case of pair housed animals.

PROCEDURE

Thirty-five 22 day old male albino rats, Sprague-Dawley strain, were divided by randomly assigning animals from any one litter into three groups, one containing eleven and remaining two groups containing twelve rats each. Animals of two groups were each handled daily for periods of 5 (group I, $N = 12$) and 10 (group II, $N = 11$) min for 21 days. Handling consisted of holding the animal in the experimenter's left hand and stroking it as described by WEININGER. The third group served as controls (group III, $N = 12$) and were handled only when all animals were weighed at age 23 days (when experiment commenced) and, thereafter, at ages 37, 45, 52, 59, 66, 73 and 79 days. Animals in the two experimental groups were weighed each day for 21 days during the period of gentling. On days 59 and 66, animals of all groups were introduced individually for 2 min to a 3×5 ft black open field divided into fifteen squares of 1 ft^2 dimensions. The field was elevated approximately $3\frac{1}{2}$ ft from floor. Each animal's activity was observed and recorded as previously described. These observations consisted of measures of amount of movement, number of defaecations and urinations, face washings rearing up on hindlegs, crouching, backing up, jumping or falling off table top, and extending head over table's edge (STERN, 1956).

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After final weighing on day 79, all animals were immobilized for 48 hr during which time they were deprived of food and water. Immobilization was achieved by wrapping each animal individually with gauze, adhesive tape and plaster of paris bandage. The resulting cast was open at both ends to allow for respiration and defaecation. All four legs were wrapped inside the cast and animal was placed on its back during the 48 hr period of stress.

On day 81, all animals were sacrificed. After the casts had been removed, the animals were autopsied. Hearts were weighed and their weight expressed in grams/100 grams of body weight. Mucosa of stomach and of the small intestine $\frac{1}{2}$ in. proximal to it, were examined with a magnifying lens for areas of bleeding or ulceration. Body length was determined as distance from tip of rat's nose to base of tail. Both body and tail length were measured to the nearest $\frac{1}{16}$ in. All evaluations were made blindly, i.e. without evaluator's knowledge as to group from which animals were drawn.

All animals were fed a diet of Ralston-Purina laboratory chow until the terminal 48 hr period of stress. Daily water consumption was measured for each group and values/animal per day determined in millilitres. Each group was housed in cages measuring 12 in. by 36 in. by 10 in. Animals were weighed to nearest $\frac{1}{2}$ g.

RESULTS

Of the thirty-five animals three died prior to the period of stress; all of these animals were in the control group. One animal in the 10 min handled group, died during the early part of the stress period.

Mean weights, based on animals surviving 48 hr immobilization are presented in Table 1. Analyses of variance were carried out for each day all animals were weighed. No significant F values were obtained and thus no *t*-tests were computed (McNEMAR, 1955). Although from Table 1 there appear to be differences between groups, within group variability in all groups was so great as to overshadow mean differences.

Owing to the large weight variability, the data were further analysed by litter comparisons. Seven animals in each group could be matched by litter and an analysis of variance by ranks was performed. Again, no significant weight differences between groups were observed.

The mean water intake/animal per day, after an initial lag period, levelled off in a range of 30–35 ml/animal per day. It was, however, observed that animals of the 5 min group reached terminal range of water intake sooner than the other two groups The control group was conspicuous in that it was slower to reach and maintain this level of water intake when compared to the other two groups. The 5 min group reached 30–35 ml range at day 33, the 10 min group at day 43, and the control group at day 55.

No open field measure discriminated between any of the groups; this was true for both the first and second introduction to the open field.

There were no significant differences in heart weights, tail lengths or body lengths between the three groups.

There was a significant difference between those not handled (control group) and those handled (5 min or 10 min groups) in reaction to the stress of 48 hr immobilizations as reflected in gastrointestinal evaluations. Those animals which

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were handled showed fewer ulcerations and haemorrhages in stomach lining. The two handled groups had 25 per cent and 20 per cent of animals with haemorrhagic areas while 67 per cent of the unhandled animals developed such haemorrhagic areas. There was no significant difference between 5 and 10 min. groups as shown by P values determined by χ^2 (I–II N.S.; I–III P between 0·05 and 0·10; II–III P beyond 0·05; (I–II)–III P beyond 0·02).

TABLE 1.—MEAN WEIGHT IN GRAMS FOR DURATION OF EXPERIMENT

Day	23	37	45	52	59	66	73	75
Group I (5 min handling)	59·9	138·8	183·5	219·5	251·5	275·2	299·8	314·3
Group II (10 min handling)	63·9	126·0	165·6	200·8	227·7	252·9	271·4	291·0
Group III (control)	60·5	135·1	166·7	193·0	218·4	254·3	270·5	275·8

DISCUSSION

The generally negative findings of the present study as compared to those of WEININGER suggests that the housing variable is important in determining effects of handling on such variables as weight, body length and response to exposure to open field. On the other hand, development of haemorrhagic lesions in stomach as a function of exposure to 48 hr of immobilization appears to be affected by handling, and relatively independent of the housing variable. As in WEININGER's experiments fewer of the handled animals developed such lesions than did those of the control group.

Another suggestion that handling, in spite of group housing, may have enhanced the animals resistance to stress is the finding that during the experimental period prior to immobilization, three animals died. These animals were all in the unhandled group. Thus, handling appears to have increased the animal's resistance to stresses of group housing, or simply increased viability in the absence of any extraordinary stresses.

A notable difference between our and WEININGER's animals was that our animals tolerated the immobilization stress better. He reported that mucous had to be sucked out of animal's mouth every 4 hr, ostensibly to prevent animals from choking. We observed our animals carefully during the entire 48 hr and at no time found it necessary to remove mucous from animal's mouth. This would suggest that either strain differences, or differences in security of wrapping may have decreased stress response in our experimental series.

SUMMARY

Differential amount of handling during infancy with group housed animals did not produce the weight and body length changes reported by WEININGER. In response to stress of immobilization, the non-handled animals showed greater gastrointestinal damage. No differences in heart size were noted.

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RAPID INCREASE OF PLASMA UNESTERIFIED FATTY ACIDS IN MAN DURING FEAR

P. V. CARDON Jr., M.D.* and R. S. GORDON Jr., M.D.†

THE role of plasma unesterified fatty acids (UFA) in the transport and metabolism of fat is a subject which has received considerable attention in recent years; experimental results up to the present time have been reviewed by FREDRICKSON and GORDON (1958). It appears that this small, but highly labile, plasma component serves to transport fatty acids from the depots to viscera during fasting, and thus provides a source of energy. In addition, exogenous fatty acids, while transported largely as triglycerides contained in chylomicra, also appear to some extent in the circulating plasma as UFA. In human subjects, plasma UFA concentrations are extremely labile. They tend to rise with continued fasting and fall sharply after the ingestion of glucose or amino acids, or the parenteral administration of insulin or glucagon. On the other hand, the administration of epinephrine results in a rapid increase (DOLE, 1956; GORDON and CHERKES, 1956; GORDON, 1957; BIERMAN *et al.*, 1957). Because of the effect of epinephrine on UFA concentrations, and because patients undergoing cardiac catheterization had been found to have higher average UFA concentrations than subjects not undergoing a stressful procedure, it seemed desirable to attempt to demonstrate an effect of environmental stimuli on the circulating UFA concentration in healthy human subjects.

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METHODS

Fifteen subjects, all in good health, were studied. There were 11 males and 4 females, ranging in age from 18 to 25 years (median 20 years). All were volunteer research subjects hospitalized in the Clinical Center of the National Institutes of Health. Some were more accustomed to research procedures than were others. The time interval between admission to the hospital and the experiment varied from 361 to 4 days (median 11 days). All subjects knew one of us (R. S. G.), and had been told by him on a previous day that a test would be performed which would involve stimulation of the adrenal gland and measurement of the effect on UFA.

On the morning of the test R. S. G. conducted the fasting subject to a patient observation room used regularly by the National Heart Institute. The subject lay supine on a comfortable table, a slow normal saline infusion was started in the right antecubital vein, and a nurse began taking pulse and blood pressure in the left arm at 1 min intervals. R. S. G. drew sample (I) through the infusion needle. He then left the room.

P. V. C. then entered wearing surgical gown and mask. He introduced himself, donned gloves, exhibited a large needle, asked the subject to turn on to the right side and began to swab the lower back with alcohol. Meanwhile, he "explained" the procedure of "adrenal stimulation" as though trying to reassure, but accomplishing the opposite. "This local anesthetic will prevent *most* of the pain. There is no danger . . . if you hold perfectly still." Such activity continued until R. S. G. reentered the room and drew sample (II) (5 min after (I), and through the same needle).

The subject was then told to turn back to the supine position and the hoax was explained. Each subject promised not to discuss the procedure with his fellow volunteer patients. Sample (III) was

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then drawn 10 min after sample (II). The samples were analysed for UFA by a method which has been described elsewhere (GORDON, 1957).

Plasma (3 ml) was lyophilized, and the dry powder extracted with equal volumes of glacial acetic acid and *iso*octane. After washing with dilute sulphuric acid, duplicate aliquots of the octane solution were titrated with aqueous sodium hydroxide, using Nile blue as indicator. By this method, recovery of added stearic, palmitic and oleic acids is excellent, whereas interference from other naturally-occurring carboxylic acids (acetoacetate, lactate, urate, cholate, etc.), or from phospholipids is negligible. The standard error for a single determination is 0·02 mEq./l.

RESULTS

The results appear in Table 1. With some exceptions, there was a rapid rise in UFA between samples (I) and (II), and a slower rise between samples (II) and (III). (In each subject the initial rise was at least twice the intrinsic standard error of the chemical method of 0·02 mEq./l.). It will be noted that only 12 of the 15 studies

TABLE 1.—CHANGES IN PLASMA UFA DURING AND AFTER SHAM TRAUMATIC PROCEDURE*

Subject	Sex	Date	Hospital day	Plasma UFA mEq./l.			
				(I)′	(I)	(II)	(III)*
A	M	31/8/56	11		0·209	0·380	0·467
B	M	31/8/56	11		0·268	0·374	0·377
C	M	31/8/56	11		0·249	0·293	0·293
D	F	7/9/56	18		0·264	0·308	0·346
E	M	7/9/56	18		0·243	0·346	0·370
F	F	2/11/56	60		0·169	0·215	0·194
G	F	2/11/56	361		0·352	0·531	0·691
H	M	2/11/56	142		0·191	0·267	0·288
I	M	16/11/56	11		0·375	0·872	1·130
J	M	16/11/56	11		0·433	0·633	0·834
K	F	7/12/56	32		0·854		1·073
L	M	25/1/57	82		0·237	0·284	0·317
M	M	25/1/57	9		0·503	0·618	0·227
N	M	8/2/57	4	0·357	0·549	0·639	0·878
O	M	8/2/57	4	0·728	1·231	1·118	1·128
Averages ± standard deviations†					0·291 ± 0·103	0·427 ± 0·173	0·461 ± 0·282

* Time elapsed between samples (I)′, (I) and (II) was 5 min; between samples (II) and (III), 10 min. Sham trauma took place between (I) and (II) in all instances.

† $N = 12$ (excludes subjects *K*, *N* and *O*).

conform strictly to the basic design of the experiment. In these 12 subjects the increase in UFA during the 5 min "fear" period ranged from 0·044 to 0·497 mEq./l. The average increase was 0·136 mEq./l. and the median increase 0·103 mEq./l. A reasonable approximation of the rate of increase which usually occurs during fasting is 0·005 mEq./l. per 5 min, a figure derived by interpolation from the data of previous studies (GORDON, 1957), in which blood was drawn at hourly intervals over a 3 hr period.

In subject *K* the infusion infiltrated during the "fear" period, and 15 min elapsed before a second blood sample could be obtained from the same vein. *N* and *O* were the last subjects studied. Two "control" samples were taken 5 min apart before the

"fear" stimulus. In both subjects the "control" rate of rise was greater than the average rate during "fear" observed in the other subjects. In one instance the second "control" UFA value was the highest observed in the entire study. Apparently here, as in other studies involving contrived "stressful periods," the general setting of the study may be more important than planned stressful stimuli. Although these subjects denied it, we cannot be sure that they had not learned from their friends exactly what to expect.

Seven subjects, while lying in their own beds, received saline infusions at intervals ranging from 3 days before, to 14 days after, the experimental "fear" procedure. Two blood samples were drawn 15 min apart through the infusion needle. In Table 2

TABLE 2.—CHANGES IN PLASMA UFA DURING INFUSION OF NORMAL SALINE ON ANOTHER DAY*

Subject	Experimental day Change in 15 min	Control day (I)	Control day (II)	Control day Change in 15 min	Interval (days)
F	0·025	0·248	0·293	0·045	14
J	0·401	0·509	0·842	0·333	3
I	0·755	0·309	0·515	0·206	3
K	0·219	0·548	0·568	0·020	−3
H	0·097	0·200	0·209	0·009	5
D	0·082	0·242	0·242	0·000	7
G	0·339	0·239	0·212	−0·027	5
Averages	0·274	0·327	0·411	0·084	

* Subjects similarly lettered are the same subjects as in Table 1.

the changes in UFA during this procedure are compared with the changes between samples (I) and (III) on the experimental day. The average 15 min increase in UFA in these 7 subjects on the experimental day was 0·274 mEq./l. and on the control day 0·084 mEq./l. The difference is significant ($P = 0·025$, one-sided t-test).

In six subjects the change in UFA was substantially smaller on the control day. In subject *F* the rise on the control day was greater, but there was relatively little change on either day. The average rise in 5 of the subjects was 0·009 mEq./l. (0·003 mEq./l. per 5 min). In subjects *J* and *I* the control rise, though smaller than on the experimental day, was much greater than in the other subjects. It is possible that the relatively short 3 day interval between experimental and control procedures was important here, the experimental day being fresher in the subjects' minds. Two additional blood samples were drawn by venipuncture 15 min apart from subject *J* 3 days later. This time a slight drop in UFA occurred (0·304–0·262 mEq./l.). Subject *I* was not tested again.

On the experimental day, subject *M* was unusual. His was the only instance in which sample (III) contained less UFA (by 0·276 mEq./l.) than the initial sample, which in this case was relatively high. The next day, venipuncture samples taken 15 min apart contained 0·245 and 0·370 mEq./l., an increase of 0·125 mEq./l. Apparently an individual may exhibit a rapid rise *or* fall in UFA, probably dependent on

variations in the environment and his reactions to them, and perhaps also on metabolic factors which cannot be fully controlled.

Pulse rate and blood pressure were recorded at approximately 1 min intervals throughout the experimental procedure. The present experiments are not adequate to make a satisfactory study of the relationship of these variables to UFA concentrations. Our necessarily inconclusive analysis of these data is therefore not presented in detail. The most that can be said is that we found no evidence of a relationship. For instance, substantial increases in UFA occurred in some subjects whose heart rate or blood pressure decreased concurrently.

Similarly, no effort was made to obtain reliable data on psychic phenomena at the time of the experiment, nor to evaluate the subjects psychologically. However, in previous studies it had been noted that a hospitalized individual's fasting UFA tends to decrease as the days go by. It was therefore thought that in the present study initial UFA would tend to be relatively low in subjects who had been in the hospital a long time. The rank order correlation between initial UFA and days in hospital prior to the experimental day is minus 0·47 (P less than 0·05, one-sided test).

CONCLUSIONS

On the basis of the data presented we believe that psychic phenomena can change plasma UFA levels quickly and profoundly. It is reasonable to infer that in a large majority of individuals plasma UFA increases when fear is experienced. Probably increased sympathetic nervous activity is one link in the chain of events leading to the increase in UFA. We do not think that failure to find a simple relationship between systemic blood pressure, heart rate, and UFA weakens this hypothesis. (An increase in the activity of the sympathetic nerves which supply an extremity might occur independently of heart rate or blood pressure changes.)

The fact that UFA continued to rise after attempted reassurance might suggest that the metabolic effects persisted well beyond the time of the effective stimulus This would certainly not be unusual. Fortunately one subject lowered his UFA very quickly after reassurance. This isolated but definite fact strengthens an alternative hypothesis more consistent with the short metabolic lives of the sympathetic neurohormones and UFA; that there is little inertia in the system and that the sustained rise in UFA was the result of continuing effective stimuli. The "reassurance" may have allayed some fears, but it could hardly be expected to promote tranquillity. We come to the tentative conclusion that elevated UFA may accompany a variety of affective states.

The increase of UFA observed in this study was probably due to augmented rate of entry into plasma. Combustion of UFA may also have increased, but to a lesser degree. We did not take arterial blood in this study and therefore do not have direct evidence for these conclusions. However, epinephrine accelerates release of UFA from adipose tissue *in vitro* (GORDON and CHERKES, 1958). It is reasonable to suppose that intravenous epinephrine and norepinephrine have this effect, and that the effect of fear is similar. Evidence of increased fat metabolism (rise in blood ketones) under conditions of psychic stress has been presented by HINKLE and co-workers (1950).

The concept of neuro-humoral control of adipose tissue is not new. References to earlier work are given in reviews by WERTHEIMER and SHAPIRO (1948) and ELLIS (1956). Although some evidence seems to conflict, the bulk of information about fat

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and carbohydrate metabolism is compatible with the following formulation: Confronted by an emergency, an individual burns fat wherever possible and conserves glucose for use by the central nervous system, expecting, as it were, not to eat until the emergency passes. Aside from obvious pertinence to the course of diabetes mellitus, the clinical implications of the information supplied by this study are unclear. Certainly investigators studying UFA should consider how psychic factors may influence their results.

SUMMARY

Plasma unesterified fatty acids (UFA) were measured in 15 healthy young volunteers before, during and after a sham traumatic procedure.

It is concluded that psychic stimuli can cause large and rapid changes in UFA.

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CHANGES IN BLOOD PRESSURE OF HYPERTENSIVE PATIENTS WITH AND WITHOUT GROUP PSYCHOTHERAPY*

J. L. TITCHENER, M.D., M. B. SHELDON, M.D. and W. D. ROSS, M.D.

WE have had the opportunity to observe a number of negro women, with a clinical diagnosis of essential hypertension, through a course of group psychotherapy while they were under concurrent medical observation. We have been able to compare the blood pressure changes of the patients in group psychotherapy with those obtained for a similar group who did not participate in this type of treatment. This is a short clinical note, supported by statistical data, rather than an account of a complete experiment. We do not know of any reports as to what happens to the blood pressures of hypertensive patients in group psychotherapy. In view of the time and effort involved in obtaining such data and the problems confronting psychotherapeutic experiments with hypertensive patients over long periods of time without complicating medical treatment concurrently, it appears justified to present our findings even though only a tentative conclusion could be reached.

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METHOD

This study was made possible by collaboration with investigators of the Department of Medicine who were conducting a long term double-blind evaluation of the effect of rauwolfia serpentina and reserpine (SHELDON and KOTTE, 1957). In the process of the drug evaluation weekly blood pressure readings were taken in the supine, seated and standing positions after at least 20 min rest. Sixteen of the patients, 14 negro women and 2 negro men, were referred for psychiatric interview. The first 9 of these, all women, were started in group psychotherapy. The last 7 to be interviewed had no further psychiatric investigation or treatment. Of the first 9, 2 dropped out of group psychotherapy after attending fewer than 4 sessions and 2 others attended more than 3 but less than 12 sessions. Thus, there were 5 patients who attended from 12 to 26 group psychotherapy sessions ("experimental" group) and 7 patients who attended no group psychotherapy sessions ("control" group).

Comparisons in blood pressure have been made between these 2 groups from a time previous to group psychotherapy to a time during group psychotherapy.

The "previous" figures were based on the first 5 weekly readings of lying blood pressure over a 6 week period ending 2 weeks before the start of group psychotherapy. The "during" figures were based on the 5 weekly readings of lying blood pressure over a period beginning 4 months after the start of therapy.

Periods on rauwolfia serpentina, reserpine or placebo were random in relation to "previous" and "during" periods of experimental and control groups. Inspection of the chance differences in these indicated that they were not in a direction which would contribute to the results being reported in this paper.

OBSERVATIONS

The mean *change* in blood pressure for individual patients in the experimental group (systolic $+7{\cdot}3 \pm 7{\cdot}2$; diastolic $+4{\cdot}3 \pm 4{\cdot}1$) was compared with the mean *change* in blood pressure for the individual patients in the control group (systolic $-13{\cdot}8 \pm 5{\cdot}9$; diastolic $-7{\cdot}5 \pm 3{\cdot}9$). Although the

* From the Departments of Medicine and Psychiatry of the University of Cincinnati and the Cincinnati General Hospital. The authors wish to acknowledge help in the collection of data to the following internists: Drs. R. A. HELM and H. A. KOTTE, and psychiatrists: Drs. S. BLOCK, S. NEWMAN and J. ORDWAY, and in the analysis of the data to G. GLESER, Ph.D., L. GOTTSCHALK, M.D. and M. LEVINE, M.D.

changes for each group alone were not significant, *the differences in changes between the 2 groups were significant in regard to systolic blood pressure* ($t = 2{\cdot}26$, $P < 0{\cdot}05$) but not quite significant in regard to diastolic blood pressures ($t = 2{\cdot}10$, $0{\cdot}05 < P < 0{\cdot}10$).

When "experimental" and "control" groups were enlarged by including the patients who dropped out of group psychotherapy (those who attended more than 3 sessions in the experimental group and those who attended 3 sessions or less in the control group) the differences in the changes were significant in regard to both systolic blood pressure ($t = 2{\cdot}19$, $P < 0{\cdot}05$) and to diastolic blood pressure ($t = 2{\cdot}19$, $P = 0{\cdot}05$), but the changes in blood pressure for each group alone were still not significant.

It is to be noted that these observations pertain to the changes in blood pressure for individual patients in which each patient served as his own control regardless of the absolute blood pressure levels.

DISCUSSION

These trends suggest that the "control" patients tended toward a drop in blood pressure over the 4 month interval while the "experimental" patients did not demonstrate this tendency. A fall in blood pressure levels has previously been described as occurring in hypertensives who are being followed in a sustained relationship (REISER, BRUST and FERRIS, 1951). The significant differences between our two groups would appear to be in the direction of a failure of the "experimental" patients to follow this tendency of the "control" patients.

If the "experimental" and "control" groups were not significantly different at the outset, then the difference in the change in blood pressures suggests that some transference or counter-transference problems in the group psychotherapy situation may have interfered with the usual beneficial effect of the individual doctor–patient relationship.

We did not observe any initial differences between these 2 groups with respect to either medical or psychiatric criteria. It is possible that the 9 patients who were referred first for psychiatric interview, and started in group psychotherapy, were individuals for whom there were beginning difficulties in the doctor–patient relationship in comparison with the 7 patients who were referred later. This is considered unlikely since the referrals were made by one physician who knew all the patients and who aimed to select equivalent groups, the first ones to be started in group psychotherapy and the later ones to be interviewed as "controls" at a later date.

Other attempts at psychosomatic deductions from the data about these patients proved inconclusive. For example, statistical analyses of the following hypotheses were not significant: (a) that psychiatric evaluations can be used to predict which individuals will respond to rauwolfia with lower blood pressures than when they are on a placebo; (b) that there is a correlation between blood pressure level and amount of suppressed hostility as evidenced in group psychotherapy; (c) that there are differences in the expression of hostility in group psychotherapy by patients depending on whether they are receiving rauwolfia or placebo.

Finally, no conclusions can be drawn concerning the long term value of group psychotherapy for patients with arterial hypertension. The group psychotherapy was discontinued after 6 months.

CONCLUSION

Participation in group psychotherapy may nullify a hypotensive effect which can occur with medical management alone. This possibility should be considered in weighing the indications and contra-indications for group psychotherapy for persons with elevated blood pressure.

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SUMMARY

(1) A series of 16 hypertensive negro patients, subjects of a double-blind evaluation of hypotensive drugs, were included in a study of the influence of group psychotherapy on blood pressure changes: 7 of these subjects participated in group psychotherapy. Blood pressures were recorded weekly on all 16.

(2) Changes in blood pressure levels from a period previous to group psychotherapy to a time during group psychotherapy were calculated for all 16 subjects. The patients in group therapy were compared with those who did not enter this phase of treatment.

(3) Statistical analysis indicated that the patients not participating in group therapy tended toward lower blood pressures, while the group therapy patients tended toward a rise. These tendencies were not statistically significant but the *difference* in change between the 2 groups was significant with regard to systolic pressures and nearly significant with regard to diastolic levels.

(4) It is concluded that group psychotherapy for hypertensive patients may at least temporarily nullify the hypotensive effects of medication and the benefits of the individual doctor–patient relationship.

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ON THE GLOMERULAR FACTOR OF WATER DIURESIS*

M. GERBNER, M. B. KOVACS and K. ALTMAN

ABSORPTION of water results in a decrease of the osmotic pressure of body fluids, osmoreceptor activity inhibits the secretion of antidiuretic hormone, the distal (facultative) tubular water reabsorption does not take place and water diuresis results (VERNEY, 1946, 1947; GILMAN and GOODMAN, 1937; KLISIECKI *et al.*, 1933). Recent experiments, in which water diuresis is brought about without changing osmotic pressure, either by increasing the volume of plasma, or of extracellular fluid, or by altering the distribution of fluids, indicate that receptors sensitive to changes in volume play a role in the diuretic reflex (METCALF, 1944; SMITH, 1952; WELT and ORLOFF, 1949, 1951; CORT, 1953; STRAUSS *et al.*, 1951; STRAUSS, 1952). After the osmotic and volume relations are readjusted as a result of an increase in water excretion, the enhanced antidiuretic hormone output reduces water diuresis to the predrinking level. While the role of the tubules in water diuresis is unquestionable, many workers have observed in man, rabbit and dog an increase in filtration parallel with diuresis, whereas others have not found this, or have ascribed it to a methodical error (ADAM, 1955; BROD and SIROTA, 1949; CHASIS and SMITH, 1938; DICKER and HELLER, 1945; FORSTER, 1947; GERBNER *et al.*, 1956; JOLLIFE *et al.*, 1932; JOSEPHSON and KALLAS, 1954; KAPLAN and SMITH, 1935; REHBERG, 1926; SHANNON, 1936; SMITH, 1951).

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EXPERIMENTAL METHODS

Six trained female dogs, weighing from 12 to 25 kg were used. The ureters were sutured to the abdominal wall (with the elimination of the bladder) by the method of PAVLOV and ORBELI, as modified by BALAKSINA (1954). The animals were maintained on a constant mixed diet and were under continuous veterinary control. Body temperature was measured regularly and clinical urinalyses were carried out at frequent intervals. The same experimenter placed the animal which had been deprived of water for from 10 to 14 hr, and of food for from 16 to 18 hr on the Pavlov stand, at the same time every day. By means of a rubber belt, urine collection funnels were provided with exchangeable dishes. In the 118 control experiments urine was collected in 15 min periods, for 135 min in each experiment. In 480 experiments, 400 ml water flavoured with 5 g of powdered milk was placed before the animal after a preliminary period, 15 min in duration. The animal drank the flavoured water spontaneously. Subsequently, urine was collected in 15 min periods for 120 min.

As we did not want to expose the unanaesthesized animal to the trauma of blood sampling or of infusion, the volume of excreted urine and its endogenous creatinine content were examined. After we found it to vary but slightly, serum creatinine was estimated at 2 week intervals, using blood obtained from the saphenous vein by percutaneous puncture after the experiment. Endogenous creatinine was estimated according to POPPER *et al.* (1937). In statistical evaluation the *t*-test was employed. It is undecided to what extent the endogenous creatinine (chromogen) clearance is a precise yardstick of glomerular filtration rate in the dog. However, data in the literature suggest that the endogenous creatinine excretion and clearance, respectively, reflect in their changes the alternations in glomerular filtration rate.

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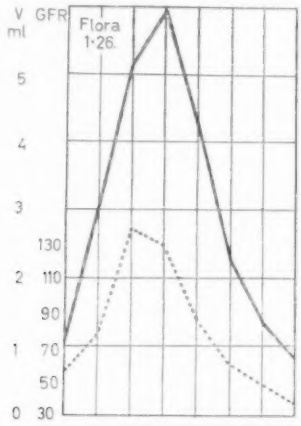
RESULTS AND DISCUSSION

Whereas in the experiments without water ingestion the endogenous creatinine excretion (E_{creat}) showed minor variations only, it increased substantially during water diuresis, reaching the maximum before water excretion reached its peak, then declined gradually toward the initial level (Fig. 1). The question is whether the increase in E_{creat} indicates a true increase in glomerular filtration rate.



	1	2	3	4	5	6	7	8
V ml	1·06	3·02	5·15	5·93	4·23	2·23	1·34	0·82
U_{kr} mg%	70	30	32	26	24	32	43	52
E_{kr}	74	91	165	154	102	71	58	43
GFR	61	76	137	128	85	59	48	36

P_{kr} 120 mg%

FIG. 1.—Parallel changes in urine output and filtration in water diuresis. The curves above were plotted from the numerical values, given for square meter body surface.
Ordinate: V (ml) diuresis/min. U_{kr} mg%: creatinine concentration. E_{kr} (g^{-5}): creatinine excretion (g^{-5}) GFR: glomerular filtration rate. Abcissa: 1–8: 15 min periods.
———: diuresis; . . . . . : filtration; P_{kr}: Plasma creatinine.

When the urine output is increasing, a value exceeding the true glomerular filtration rate is obtained owing to "dead space error", i.e. to an elimination of concentrated urine produced during low diuresis and in the dead space of the urinary tract during the phase of rapidly increasing diuresis. The urine coming from the dead space is, however, more dilute than the next sample in the descending branch of the diuresis curve and thus, if we examine the complete diuresis curve, the error due to dead space is eliminated. In 2 hr water diuresis is almost complete, but if it is not, the delay of concentrated urine in the dead space diminishes the amount of creatinine eliminated in the urine. Nevertheless, the amount of creatinine eliminated in 2 hr is substantially greater in water diuresis than in the experiments not involving ingestion of water (Fig. 2). It speaks also against the exclusive role of dead space that glomerular filtration rate shows not only a single peak (that is produced when the urine output is increasing), but its value decreases gradually after the increase.

According to SHANNON (1936*b*) in the dog values for inulin and creatinine clearance may decrease below a diuresis level of 0·5 ml. According to BALINT *et al.*, (1953, 1956) in such a low diuresis the urinary inulin clearance is lower than the real value computed

from the directly computed renal blood flow. For this reason we have re-examined 75 experiments in which the lowest diuresis was above 0·5 ml. In three of these experiments (4 per cent) E_{creat} decreased, whereas in the others it increased, depending on the water diuresis: in 12 (16 per cent) by 0 to 25 per cent of the initial value, in 18 (24 per cent) by 25 to 50 per cent, in 22 (29 per cent) by 50 to 100 per cent and in 20 (27 per cent) by more than 100 per cent of the initial value.

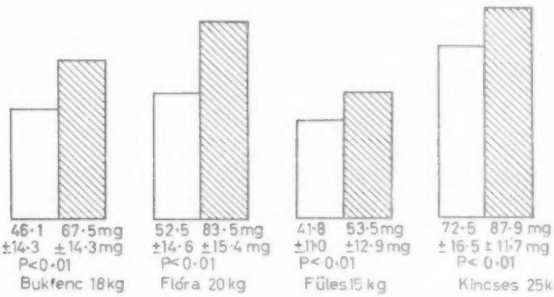


FIG. 2.—Increase of endogenous creatinine excretion in water diuresis. Each empty column represents the mean for twenty-five experiments. (Mean endogenous creatinine output in 120 min.)

Thus, E_{creat} increases even if we exclude the role of dead space or of oliguria. The reabsorption of creatinine in the presence of a low diuresis was discredited by SHANNON (1936). According to this author the glomerular filtration rate changes parallel with those in diuresis are in correlation with extreme variations in hydration in the diuresis ranges below 0·5 ml and above 4·0 ml. These values, however, are the physiological ones for everyday water diuresis and occur as a rule after the ingestion of water equivalent with about 2 per cent of the body weight. SHANNON (1936*b*), as well as SMITH (1951), deny the possibility of a functional correlation between the changes in glomerular filtration rate and in diuresis also because urine output may change significantly, although glomerular filtration rate is either unchanged, or changes insignificantly. This, however, is explained by changes in the tubular mechanism that are independent of filtration.

On the basis of all that has been elaborated above we have no reason to believe that the increase in E_{creat} is not due to a true increase in glomerular filtration rate. And even a slight increase in glomerular filtration rate may significantly enhance urine output.

SUMMARY

In unanaesthetized dogs with ureter fistula the endogenous creatinine excretion increases after the ingestion of a quantity of water equivalent with about 2 per cent of the body weight. This increase is not due to a dead space error, or to a strong oliguria. This evidence lends support to the possibility that alongside the reduction in tubular reabsorption an increase in glomerular filtration rate may be involved in the mechanism of water diuresis.

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THE EFFECT OF HABITUATION TO THE ENVIRONMENT AND TO ITS ALTERATIONS ON WATER DIURESIS IN UNANAESTHETIZED DOGS*

M. GERBNER, M. B. KOVACS and K. ALTMAN

THE excitatory state of the cells in the central nervous system depends on the stimuli of the environment. According to PAVLOV, a new environment will elicit a series of orientative reactions and excitation in the experimental animal in early trials (PAVLOV, 1927). Later the orientation reactions are extinguished and the internal inhibition spreads over the whole cortex. New stimuli (a new environment, or new stimuli of the old environment) create foci of excitation, suppress the inhibition and alter the functional activity of the cerebral cortex.

In our experiments we investigated the effect of these alterations in the functional activity of the central nervous system on water diuresis, that is the reflex response given by the organism to a loading with water.

EXPERIMENTAL

Six dogs, weighing from 12 to 25 kg, with ureteric fistula were used. After from 16 to 18 hr of fasting and from 10 to 14 hr of thirsting, the animal was placed by the same experimenter, at the same time every day on the Pavlov stand in a soundproof reflex chamber. By means of urine collection funnels placed under the ureteric outlets, urine was collected for 15 min. Then 400 ml water flavoured with 5 g of powdered milk was placed before the animal, which drank it spontaneously. Subsequently, urine was collected in 15 min periods for 120 min. When we did not employ stimuli intentionally, great care was taken to prevent any external stimulus from reaching the animal.

The experiments were carried out daily or every other day. To eliminate a summation of pre-experimental thirstings, in two series the animal was not thirsted and in two other series there were 3 to 5 day intervals between the experiments.

As we did not want to expose the unanaesthetized animal to the trauma of blood sampling or of infusion, we examined the volume, endogenous creatinine and sodium contents, as well as the osmolar concentration of the urine. After having ascertained that they are subject to minor variations only, serum creatinine and sodium were determined at 2 week intervals. Endogenous creatinine was estimated according to POPPER *et al.* (1937), sodium was determined in a Zeiss flame photometer and the osmotic concentration was assessed on the basis of the reduction in the freezing point, as measured by a Beckman thermometer (BALINT and HEGEDUS, 1955; GRADWOHL, 1956). The details of the methods employed have been described elsewhere (GERBNER *et al.*, 1959).

RESULTS

In the early phase of the experiments the animals showed a typical water diuresis. About 30 min after drinking diuresis began to increase and the concentration of the urine began to decrease. After 60–90 min the minute diuresis reached its peak, the urine excreted being very dilute. Subsequently, diuresis gradually decreases and the concentration of the urine increases. In 2 hr 70–90 per cent of the water ingested is eliminated. However, if the experiment is repeated from ten to twenty-four times, the diuresis curve becomes gradually flatter, the peak shifts backward, the urine output significantly decreases and in many cases water diuresis does not result at all,

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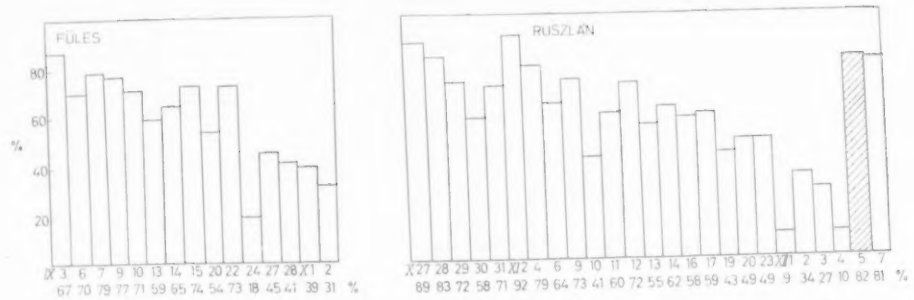

FIG. 1.—The reduction in the volume of urine output during the 120 min following water intake in a non-stimulative environment and its increase during stimulation. Ordinate: volume output in percentage of water intake. Abscissa: experimental days. Empty column: urine output in non-stimulative environment. Shaded column: urine output during stimulation.

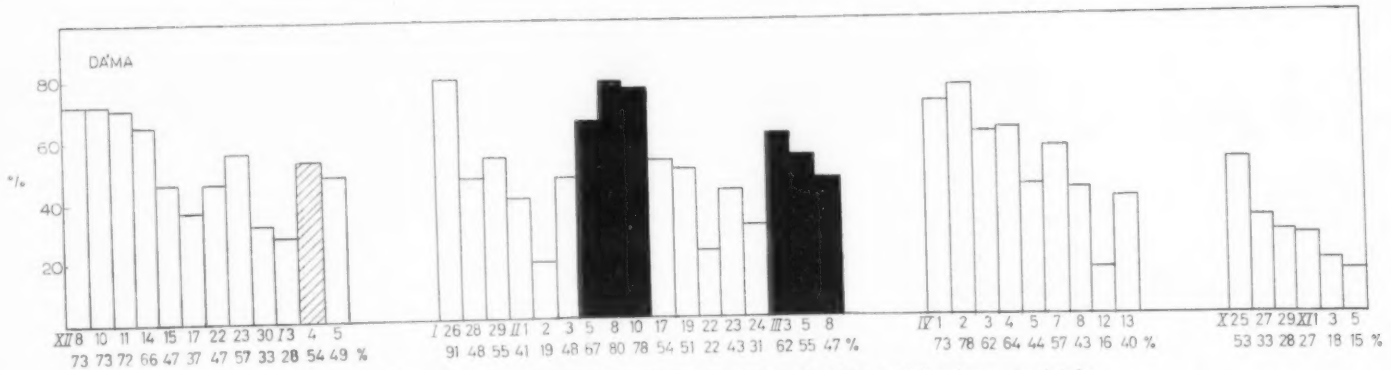

FIG. 2.—Changes in the volume of urine output during the 120 min following water intake in a non-stimulative environment, during stimulation, on resumption of experimentation and in a foreign room. Signs as in Fig. 1. Solid column: experiments in new room.

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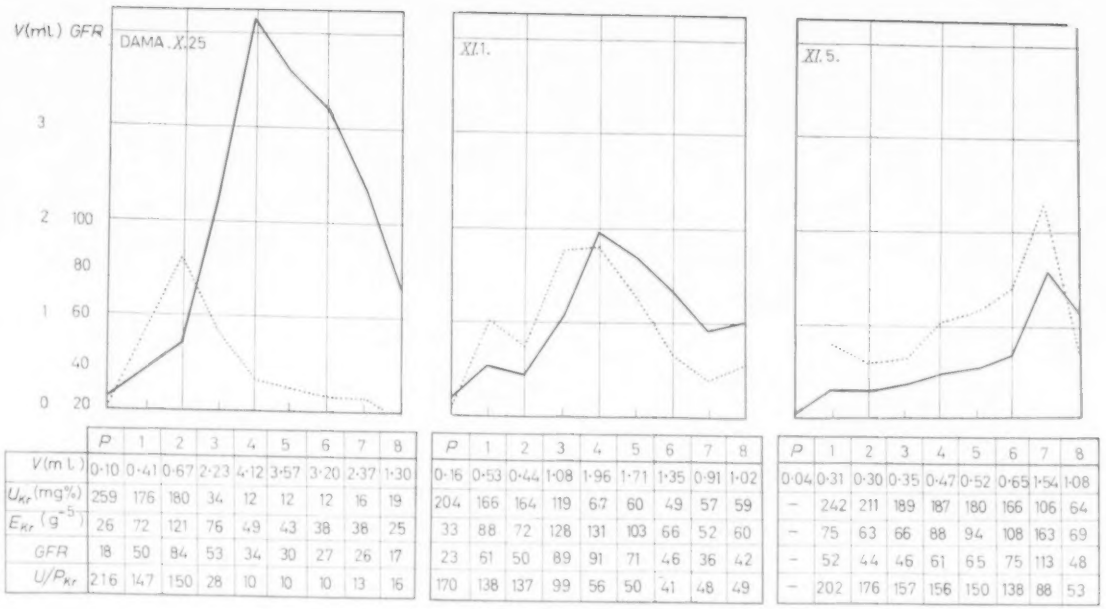

	P	1	2	3	4	5	6	7	8
V(ml)	0·10	0·41	0·67	2·23	4·12	3·57	3·20	2·37	1·30
U_{Kr} (mg%)	259	176	180	34	12	12	12	16	19
E_{Kr} (g^{-5})	26	72	121	76	49	43	38	38	25
GFR	18	50	84	53	34	30	27	26	17
U/P_{Kr}	216	147	150	28	10	10	10	13	16

P	1	2	3	4	5	6	7	8
0·16	0·53	0·44	1·08	1·96	1·71	1·35	0·91	1·02
204	166	164	119	67	60	49	57	59
33	88	72	128	131	103	66	52	60
23	61	50	89	91	71	46	36	42
170	138	137	99	56	50	41	48	49

P	1	2	3	4	5	6	7	8
0·04	0·31	0·30	0·35	0·47	0·52	0·65	1·54	1·08
–	242	211	189	187	180	166	106	64
–	75	63	66	88	94	108	163	69
–	52	44	46	61	65	75	113	48
–	202	176	157	156	150	138	88	53

P_{Kr} 1·20 mg %

FIG. 3.—Changes in the diuresis curve and in filtration on the inhibition of water diuresis. (Above)—the curves. (Below)—the pertinent numerical data, computed for square metre body surface.

Ordinate:	V (ml)	Diuresis/min.
	U_{Kr} (mg%)	Creatinine concentration
	E_{Kr} (g^{-5})	Creatinine excretion g^{-5}/min.
	GFR	Glomerular filtration rate
	U/P_{Kr}	Grade of increase in creatinine concentration.
Abscissa:	P	Pre-water intake period.
	1–8	Periods after water intake
———		Diuresis
.....		Glomerular filtration.

in spite of the ingestion of water. Whereas the glomerular filtration rate computed from E_{creat} remains similar to what is found in the initial high diuresis, the urine does not dilute in the flattened diuresis curves. Meanwhile the dog, which was alert and responded in a lively way to any sound initially, quietens down and stands almost motionless, with its eyes open (Figs. 1, 2, 3; Table 1).

TABLE 1.—CREATININE EXCRETION IN INHIBITED DIURESIS

V : urine output, ml/120 min.
% : urine output in percentage of water intake.
Kr : creatinine excretion, mg/120 min.

Bukfenc (17 kg)				Dàma (19 kg)			
Date	V	%	Kr	Date	V	%	Kr
11 March	262·9	66	66·5	25 Oct.	211·1	53	54·6
17 March	193·7	48	72·6	27 Oct.	133·7	33	111·6
18 March	246·9	62	75·9	29 Oct.	110·8	28	102·9
23 March	242·5	61	64·4	1 Nov.	106·5	27	82·7
24 March	140·5	35	69·3	3 Nov.	72·2	18	111·1
25 March	74·4	19	59·3	5 Nov.	61·8	15	85·7
26 March	63·3	16	70·5				

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The experiments were discontinued for periods of from 3 weeks to 3 months in three dogs. When the experiments were resumed, the initial diuresis curves were high again, but became flatter and flatter as the trials increased in number, and less and less of the water ingested was eliminated. The reduction in diuresis was usually more rapid than it had been in the first series (Fig. 2.). In twelve series of 135 experiments out of fourteen series of 164 experiments this decreasing tendency was evident.

In order to decide whether the reduction in diuresis was due to the inhibitory effect of the non-stimulative environment, we have stimulated the animals with light and sound stimuli of medium intensity throughout four experiments, made after the reduction in diuresis had taken place. The animal responded to the stimuli by a series of orientation reactions and the water diuresis, which had been decreased during the preceding days, was increased in every trial. It is interesting that urine output remained high almost invariably on the days following the experiment (though on those days the experiment was conducted soundlessly, without any stimulation) (Figs. 1, 2).

In four series of twelve experiments the animal was transferred to a formerly unknown environment, after diuresis had decreased. In the new environment urine output increased and was nearly as high as initially. When further experiments were again carried out in the reflex chamber, diuresis decreased. Later the animal was brought back to the former place, to which it responded by an increase in urine output which was, however, not so great this time as it had been on the first occasion (Fig. 2).

DISCUSSION

Prolonged stay in an non-stimulative environment leads to an inhibition of cerebral cortical cells (PAVLOV, 1927), as is shown, *inter alia*, by the motionless behaviour of the animal. The dogs could not fall asleep (they would have been wakened by their feet giving way), but sleep, an extreme spread of inhibition, is probably the final stage of the phenomenon we have investigated.

Most authors agree that the various narcotics cause a diminution or absence of diuresis (BERHIN, 1953; FEE, 1929; HELLER and SMIRK, 1932; SMITH, 1951; SENIKOV, 1955; WALTON, 1932). In narcosis (general anaesthesia) the absorption of water is not delayed (FEE, 1928) and diuresis is inhibited also when water is injected intravenously (NEWTON and SMIRK, 1933). According to MOLITOR and PICK (1923), the narcotics (anaesthetics) act through the cerebral centres regulating urine excretion. It has been suggested by many authors that in narcosis the decrease in the output of the antidiuretic hormone resulting after the water intake in the waking state does not take place (DE BODO and SWEET, 1940; DE BODO and BLOCK, 1941; DE BODO and PRESCOTT, 1945).

According to SIMPSON (1924, 1926), in man during natural sleep at night urine output is lower than in the day, even when external conditions are the same. This is confirmed by NORN (1929), who showed that when the test subject sleeps by day, the day-time urine output was smaller. According to POPPER and BROD (1938), glomerular filtration rate decreases and according to SIROTA *et al.* (1950) water reabsorption increases during sleep.

Our experiments have revealed that not only sleep, but also the finer grades of the spread of inhibition have an influence on diuresis. This explains the observation made by EAGLE (1933) who wanted to elaborate a conditioned diuretic reflex in his dog and induced it to drink water every day. No conditioned reflex developed, but water diuresis decreased. USIJEWICH (1955) has mentioned that his dog would void less urine in the reflex chamber than in other rooms. The fact that the glomerular filtration rate values measured when diuresis was reduced in the experiments were usually not lower than those observable in the initial high diuresis periods, although the methodological difficulties of glomerular filtration rate estimation do not permit one to exclude an involvement of changes in the glomerular filtration rate, indicates that the latter is not of primary importance in the diminution of water diuresis. On the other hand, the fact that the urine remains concentrated suggests that tubular water reabsorption is diminished to a lesser extent during the inhibition of diuresis than in the initial high water diureses. Thus, in spite of the ingestion of fluid the activity of the system responsible for the secretion of the antidiuretic hormone is reduced less markedly than in the initial (or stimulative) high diuresis experiments.

This indicates that the diuretic reflex taking place after water intake depends not only on the hyposmosis and hypervolemia of body fluids, but also and importantly, on the state of reflex centres. The stimuli arising from a steady environment become successively monotonous and probably lose their stimulating effect (PAVLOV, 1927; LIEBERSON and CADILLHAC, 1954; SHARPLESS, 1954). Subsequently, the outspreading inhibition alters the activity of the hypothalamic reflex centres of water metabolism. It is not possible to determine which neurophysiological mechanism is concerned, whether it is the cortical (PAVLOV, 1927) or the reticular system (MAGOUN, 1954) or the sleep centres mentioned by HESS (1954) or most probably the influence of their

mutual relations (BREMER, 1954). As a result, however, the reaction of these centres will be blocked, and in spite of the hyposmosis the production of the antidiuretic hormone is either little diminished, or unaffected and water diuresis if it occurs at all, is one of small degree.

SUMMARY

In unanaesthetized dogs the diuretic reflex response to loading with water varies within wide limits, although the volume of water administered is constant. In a non-stimulative environment, in complete rest in repeated trials water diuresis is reduced, but increases again if stimulation is applied. When diuresis is decreasing or decreased the urine is less dilute (though the golmerular filtration rate is the same) as it is in the initial high diuresis induced by stimulation. This fact suggests that in such cases the reaction of the hypothalamic centres involved in the diuretic reflex are inhibited and the production of the antidiuretic hormone is not diminished, although the organism is hydrated. This we believe to be ascribable to a spread of cerebral inhibition to the latter centres, caused by the monotonous environment. Stimulation drives back inhibition, the activity of reflex centres increases and regular water diuresis results.

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EFFECT OF STIMULI OF VARIABLE INTENSITY ON URINE OUTPUT IN UNANAESTHETIZED DOGS*

M. GERBNER and M. B. KOVACS

THE views concerning the effect of external stimuli on urine output are rather contradictory in the literature. Most authors describe a reflectory (emotional) oliguria as the response to stimulation. BECHTEREW (1905) was the first to mention that pain and fear would cause a diminution in diuresis. According to MOLITOR (1926) in unanaesthetized rabbits and dogs the restraining, and the resulting discomfort, cause a reduction in water diuresis. DOBREFF (1926) has reported that during an attack of rage the thirsting urine output was decreased in the unanaesthetized dog. In experiments on unanaesthetized dogs LEIBSON (1927), then GINECINSKIJ and LEIBSON (1929) found that the anuria elicited by painful electrical stimulation also occurred after the "*in situ*" denervation of the kidney, and was not due to ureteral spasm. This statement has been confirmed by MICHELSON (1928, 1930), who found that the anuria did not develop after the sensory nervous pathways had been disrupted. An inhibition in water diuresis has been reported to result from the insertion of a lumbar puncture needle in the anaesthetized and unanaesthetized dog (THEOBALD, 1934), from a stimulation of an afferent nerve in the anaesthetized, and from painful electrical skin stimulation, very intense auditory and other "emotional" stimuli in the unanaesthetized dog (THEOBALD and VERNEY, 1935; RYDIN and VERNEY, 1938, VERNEY, 1946). It has been shown that the effect is closely similar to that produced by the posterior pituitary extract and is different from that induced by the clamping of the renal artery. According to DANILOW *et al.* (1934) the changes in renal function are similar in oliguria and on the administration of pituitrin. HATERIUS (1939) has shown that in the anaesthetized rabbit painful stimulation does not diminish diuresis after section of the hypophyseal stalk. The dog experiments of O'CONNOR and VERNEY (1942) corroborate this evidence. In the inhibition distinction is made between a fast factor due to adrenalinemia and a slow factor due to antidiuretic hormone output (O'CONNOR and VERNEY, 1945). The role of the antidiuretic hormone is supported by the experiment of DEMSTER and JOKES (1955) who also observed a decrease in urine output in response to painful stimulation with a cervical transplant of the kidney in an unanaesthetized dog. A reduction in the glomerular filtration rate has been described resulting from exposure to a faradic current and to noise in the unanaesthetized rabbit (BROD and SIROTA, 1949) and from painful faradic stimulation in the unanaesthetized dog (ADAM, 1951). According to SURTSHIN *et al.* (1952) vasoconstriction occurred in only a small percentage of unanaesthetized dogs.

In man, a reduction in diuresis has resulted from the application of a thumbscrew (WOLF, 1943), from the cold pressor test (TALSO *et al.*, 1948) and from fear (SMITH, 1951). Whereas these authors found a reduction in the glomerular filtration rate during oliguria, KELSALL (1949, 1951) reported that in ischemic muscle pain the glomerular filtration rate was unchanged, but diuresis was inhibited in a way similar

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to that seen as a result of antidiuretic action. In oliguria induced by exposure to a carbon arc light HOFFMANN–CREDNER (1953) demonstrated a high level of antidiuretic hormone.

Other authors applied other stimuli and found urine output increased. An increase in the urine output without waterload has been described following exposure to a flickering lamp in the frog (BOYD and YOUNG, 1940), and in the rat (BOYD *et al.*, 1943). According to USIJEWICH (1953) sound stimuli used with conditioned reflexes at their first application usually produce an increase, and subsequently a decrease in the water diuresis of dogs. In his experiments on goats ANDERSON (1955) observed that the more restless animals in particular responded to catheterization and to transfer to the Pavlov stand with a substantial polyuria, which could be inhibited with pituitrin. The occurrence of psychical polyuria has been described in excited human subjects by EBSTEIN (1926), SCHWENKENBECHER (1926), STUTZIN (1926) and LUBENCKIJ (1953).

In our own experiments we have started with the assumption that the intensity of the stimulus may be responsible for the polyuric or oliguric effect of the stimulus. It had been demonstrated (GERBNER *et al.*, 1959) that in serial water-loading experiments the water diuresis response would tend to decrease, whereas new stimuli would restore water diuresis to the original level. In the present experiments we have succeeded in increasing urine output both in the absence of loading with water, and in a given period of water diuresis, by applying stimuli for a predetermined period of experiment. The same stimulus at high intensity reduced water diuresis.

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EXPERIMENTAL

Six unanaesthetized dogs weighing 12–25 kg were used. The animals with chronic ureteric fistula were experimented on while standing on a Pavlov stand in a soundproof reflex chamber, after 10–14 hr of thirsting. Urine was collected in 15 min periods, the endogenous creatinine concentration, the sodium content and the osmolar concentration of the urine and serum was determined. For the details the reader should consult GERBNER *et al.* (1959).

In part one of the experiments we have applied the following stimuli, accepted by us to be ones of "medium" strength:

(a) From 75 to 85 phon loud speech sound from a sound generator.

(b) Faradic stimulation of the skin of the left hind leg at an "around threshold" intensity, using a Du Bois–Reymond slide inductor.

(c) Exposure to flashlight effect produced by burning photographic magnesium powder.

(d) Presence of a person not belonging to the experimental staff in the reflex chamber.

The flash lasted a few minutes, the sound and skin stimuli were applied interruptedly for from 5 to 15, and in some cases for 30 min. The presence of a strange person in the chamber was similar to the latter in duration.

In part two of the experiments the following pairs of stimuli were applied to the same dog in consecutive experiments:

(a) Sound from the sound generator at 75 phon (loud speech) and 116 phon (deafeningly loud) intensity.

(b) Faradic stimulation of the left hind leg at "around threshold" intensity (that eliciting raising of the leg and turning of head) with the coil distance of the Du Bois–Reymond slide inductor varying from 9·5 to 11·5 cm, as well as painful faradic stimulation of the left hind leg (eliciting whining, jumping, defensive motor activity), with the coil distance of 7·5 to 8·5 cm.

RESULTS

A. Effect of stimuli of medium intensity

Without the ingestion of water, urine output varies only slightly. Usually the diuresis observed in the first period is followed by a slight increase in the second and

third 15 min periods, then by a decline. In the 118 experiments without water load the value increased to above the double of the second period in only 4 cases. Stimuli were applied in 17 cases, usually in the second hour of the experiment. In 8 of these cases the formerly low diuresis increased to above the double of the second period (Fig. 1). The χ^2-test showed the difference between the groups to be highly significant.

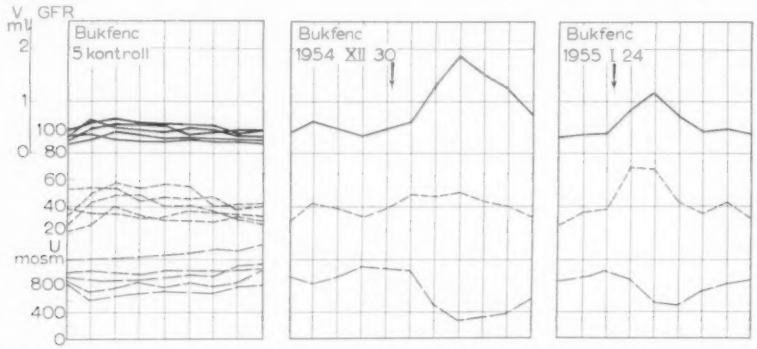

FIG. 1.—Increase in urine output on stimulation at medium intensity in experiments without water load. (*Left*)—Five control experiments without stimulation. (*Centre*)—Flash (magnesium powder). (*Right*)—Presence of foreign person.
Ordinate: V_{ml}, minute diuresis; *GFR*, glomerular filtration rate; U_{mosm}, osmotic concentration of urine.
Abscissa: 15 min periods.
———, urine output; – – – –, filtration; ——— —, osmotic concentration.
The values are given for square metre body surface.

In some experiments the increase in diuresis was associated with a moderate increase in the glomerular filtration rate and with a substantial dilution of the urine, whereas in other experiments the glomerular filtration rate was highly enhanced and osmotic concentration was unchanged.

In the 480 control experiments the diuresis curve is regular in shape after the ingestion of 400 ml of water. It increases from period to period after the fifteenth to thirtieth minute following ingestion of water, then decreases in the same way after having reached a peak. Without stimulation minor, transient increases were noted

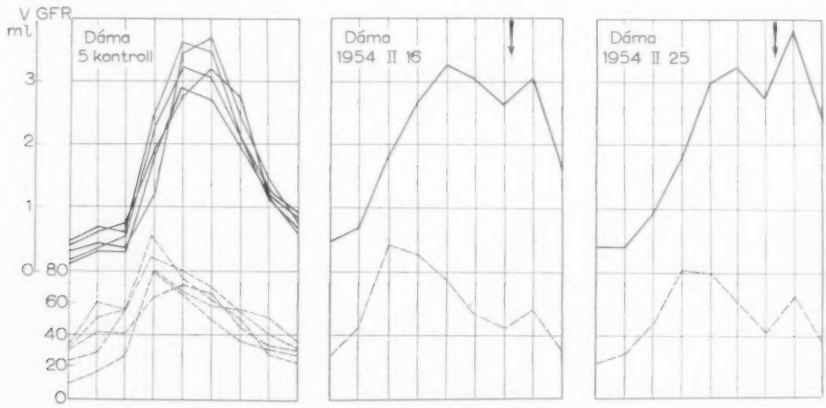

FIG. 2.—Increase in urine output on stimulation at medium intensity in water diuresis. (*Left*)—Five control experiments without stimulation. (*Centre*) (at arrow)—ringing of a bell; (*Right*)—Stimulation of the skin. Abbreviations and signs as in Fig. 1.

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in only 10 cases in the descending branch of the curve. Stimulation was applied in 30 experiments at a time when the curve was declining (when an increase can be better evaluated). In 20 of these cases diuresis increased to above the first-period level, instead of showing a further decrease (Fig. 2). The χ^2-test showed the difference between the groups to be highly significant. The glomerular filtration rate increased

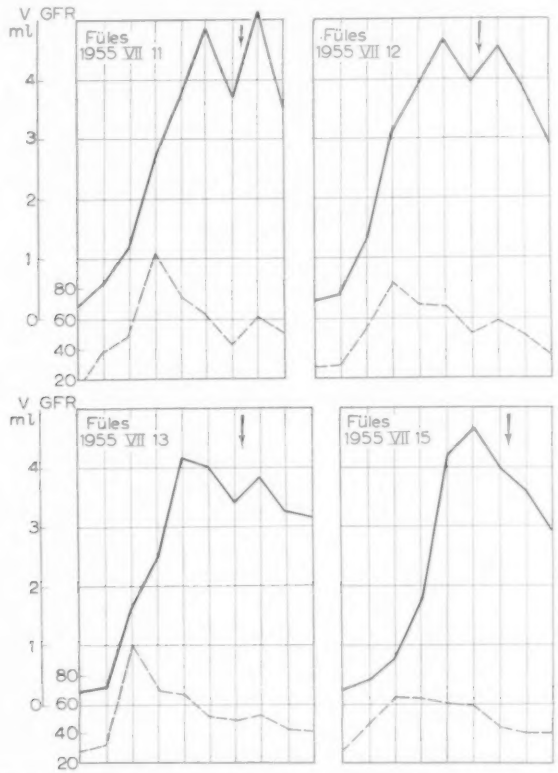

FIG. 3.—Extinction of the increase in diuresis on repeated stimulation. (Arrow)—Ringing. Abbreviations and signs as for Fig. 1.

during the period of enhanced diuresis. In experiments in which stimulation was continued for 30 min, a dilution of the urine was observable in the second 15 min period of enhanced diuresis. When the polyuria is shorter in duration, the concentration of the urine usually does not increase.

In six series of experiments the same stimulus was applied repeatedly on consecutive days. The increase in diuresis became smaller and smaller as the number of trials increased and failed to appear altogether after the second to fourth stimulation (Fig. 3). The effect is extinguished even faster when the same stimulus is applied repeatedly within the same experiment (Fig. 4).

B. Stimulation at different intensities

The two kinds of intensity were employed in 14 experiments involving 4 dogs. The stimuli of "medium" intensity were applied when the curve for water diuresis

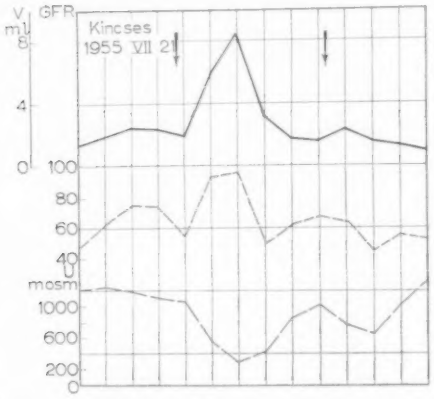

FIG. 4.—Repeated application of the same stimulus within the same experiment. (Arrow)—Flash. Abbreviations and signs as in Fig. 1.

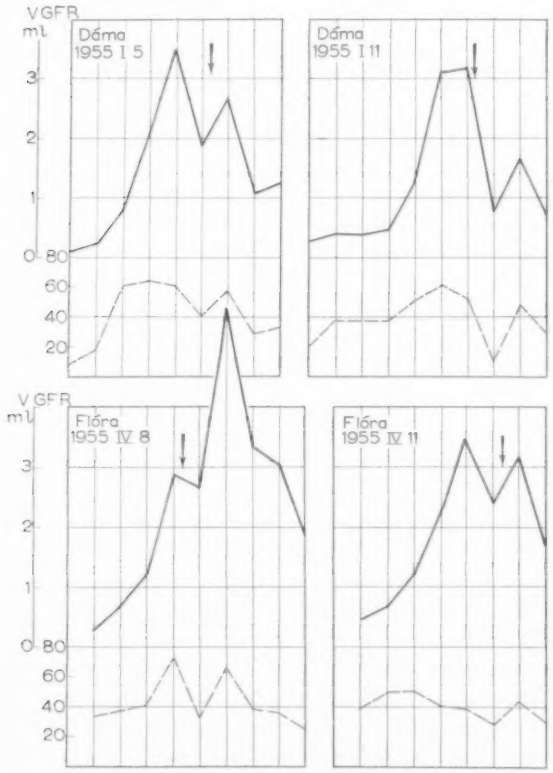

FIG. 5.—Stimulation at different intensities.
Dáma: 5 Jan. 1955. (Arrow)—Faradic stimulation, with 11 cm coil distance. 11 Jan. 1955. (Arrow)—Faradic stimulation with 8·5 cm coil distance.
Flóra: 8 April 1955. (Arrow)—115 phon generator sound. 11 April 1955. (Arrow)—75 phon generator sound.
Abbreviations and signs as in Fig. 1.

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was descending, the strong ones were allowed to act on the ascending branch, interruptedly, over a period of 15–30 min.

The stimulation with medium intensity elicited the increase in diuresis described in detail beforehand. The same stimulus, as applied with strong intensity, caused a diminution in diuresis similar to that seen in reflex (emotional) oliguria. The reduction in diuresis was associated with a decrease in filtration in every experiment (Fig. 5). In a few cases the osmotic concentration of urine was increased during oliguria.

DISCUSSION

In our experiments the stimuli of medium intensity increased urine output both in the experiments without water loading and in water diuresis. The same stimulus, as applied at a substantially higher intensity, caused a diminution of urine output during water diuresis.

An analysis of the data in the literature reveals that the divergence in the results can be traced back to differences in the intensity of stimulation. Flickering of a light bulb, sound stimuli used with conditioned reflexes, catheterization and placing on a Pavlov stand, as well as psychic excitation all increased diuresis. Pain, fright, binding to a table, an attack of rage, lumbar puncture, very loud sound, application of a thumb-screw, immersion of an arm into icy water, ischemic muscle pain, an arc light are substantially more intense stimuli, described by many authors as causing severe excitation, whining, struggling, attempts at biting in experimental animals: all these led to reflex oliguria.

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BOYD *et al.* (1943) ascribe the increase in urine output to an increased production of the diuretic hormone of the hypophysis. According to one group of authors the reflex oliguria (emotional oliguria) would be the result of an increased antidiuretic hormone output, whereas others claim it to be due to a diminution in the glomerular filtration rate.

According to our own experiments changes in the glomerular filtration rate are involved in the mechanism of enhanced and reduced diuresis alike. It is more difficult to determine the role of the tubular factor. Before stimulation the effect of antidiuretic hormone circulating in the blood may mask the decrease in secretion. The situation becomes even more involved (especially in oliguria) if we realize that the urine in the dead space of the urinary tract will be eliminated only after some delay. In the experiments in which the enhancement of diuresis is longer than 30 min in duration and thus there is time for an inactivation of the antidiuretic hormone in the blood, the urine becomes more dilute. And in many cases of reflex oliguria osmotic concentration increases. The possibility thus arises that alongside the changes in filtration an alteration in the output of antidiuretic hormone may be involved in the mechanism of these phenomena.

Stimuli of medium intensity cause initially an excitation in brain cells and elicit an orientation reaction. A variety of vegetative components (skin, galvanic, pupil, vascular reaction) (LIBERMAN and STRELCOVA, 1952; GERSUNI, 1947; TATARENKO, 1954, VINOGRADOV *et al.*, 1955) of this are known. It appears to us that the simplest explanation for the enhanced diuresis elicited by a stimulus of medium intensity is that the excitation produced by the stimulus has spread to the centres regulating renal function (located mainly in the hypothalamus), and elicits the changes described. The extinction of the effect on repeated stimulation can be explained by an inhibition

of the orientation reaction (PAVLOV, 1946; LIBERSON and CADILHAC, 1955; SHARPLESS, 1954).

A physically strong stimulus eliciting a defensive response causes a strong excitation in the appropriate cell group of the brain. The excitation, overburdening the appropriate central neurons, may lead to a state of 'top-inhibition' (PAVLOV, 1946) or parabiosis (VEDJENSKIJ, 1950). The development of this inhibition in the centres mentioned may explain the reduction in urine output.

SUMMARY

In unanaesthetized dogs stimuli of medium intensity may lead to an increase in urine output both during water restriction and after water intake. This effect decreases, then disappears on repeated stimulation.

The same stimulus enhancing urine output at medium intensity has the opposite effect at high intensity: it reduces diuresis.

Changes in the glomerular filtration rate and possibly also those in antidiuretic hormone output are involved in both effects.

In our opinion the simplest explanation for the oliguria is the spreading of the inhibition produced by the physically strong stimulus to the cerebral centres regulating water metabolism, and for the enhanced diuresis the excitation caused by the stimulus of medium intensity.

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EMOTIONAL REACTIONS AND SKIN TEMPERATURE RESPONSES IN CHILDREN AGED TWO TO FOUR YEARS*

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INTRODUCTION

THE relationship between skin temperature, behaviour and attitudes in adult patients has been extensively investigated (GRAHAM, 1955; MITTELMANN and WOLFF, 1939, 1943). No comparable studies of children have been reported. The purpose of this study was to investigate the relationship between skin temperature and behaviour in young children. The method employed was designed to yield the maximum amount of information concerning the child and to provide for study of his responses to normal life situations as well as to those which were experimentally induced.

METHOD

Experimental procedures were conducted in a pediatric, well-child clinic.† Eleven children between the ages of 2 and 4 years were studied. Nine children, five boys and four girls, continued in the study a minimum of 9 months. The average length of investigation of these nine children was 12·7 months. Each child was seen for an experimental session once a week for 8 weeks and thereafter once a month.

The standard experimental sessions were approximately 70 min in duration. The first 25 min were devoted to observations through a one-way mirror of the mother and child in a playroom. Following the playroom period the mother left the child in the experimental study room while she was interviewed by the psychiatrist. The separation period lasted approximately 40 min and was terminated by the mother's return for the child.

Skin temperature measurements were made with a Dermalor from the dorsum of the non-dominant hand at approximately 5 to 10 min intervals beginning 5 min after arrival in the playroom. Rigorous control of environmental temperature, humidity and the child's activity was not possible in this study. Room temperatures were relatively constant, however, at 24·5°C (±1·0°). A record was kept of the child's activity levels on a scale with values from 1 to 5.

The psychiatric interviews with the mothers provided anamnestic material as well as information regarding the current home situation. These data were supplemented by the nurse on home visits and by routine pediatric well-child care.

RESULTS

Skin temperature and adaptation to clinic environment

Fig. 1 shows the change in skin temperature as a function of time spent in the clinic. Data from three comparable sessions for each child were used in constructing this curve. Hand temperature was uniformly low during the first 10 min and increased gradually for 40 min after which it remained constant between 30·3° and 30·4°C. Variability in temperature was high initially and low after 40 min in the clinic (TALBOTT, 1931).

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The relationship of skin temperature to separation and return of parent

The relationship of separation and return of the parent to skin temperature responses of the children is presented in Table 1. Table 1 contains the average magnitude of change and percentage frequency of drops in skin temperature in the subjects at the time of separation and the return of the parent. The magnitude was the average change in skin temperature, plus or minus, for all responses by each child

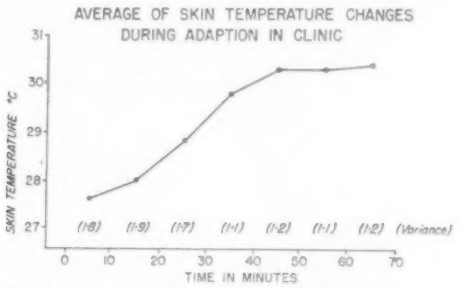

FIG. 1.—Average of skin temperature changes during adaptation in clinic.

to each variable. The unit of skin temperature change used in this determination was the difference between the preceding level of skin temperature and the measurement recorded for the variable under study. Correction for gradient acceleration (Fig. 1) was made when this factor applied.

TABLE 1.—RELATIONSHIP OF SKIN TEMPERATURE TO SEPARATION AND RETURN OF PARENT

Subject	Separation		Return	
	% Frequency of temperature fall	Magnitude (°C)	% Frequency of temperature fall	Magnitude (°C)
1	100	−1·11	50	−0·26
2	72	−1·04	50	−0·42
3	70	−1·03	50	+0·35
4	72	−0·42	50	−0·12
5	70	−0·51	90	−0·37
6	67	−0·41	42	+0·08
7	64	−0·58	44	−0·18
8	29	+0·20	80	−0·88
9	50	−0·08	87	−0·62
Mean	70·4	−0·55	60·3	−0·28

In seven of the nine children separation from the parent was associated with a fall in skin temperature more than 50 per cent of the time. Subject 1 responded with a drop in skin temperature at each separation.

This subject was an anxious, insecure boy who was unsure of his status within his family group where he was threatened by the presence of an infant, male sibling and an aggressive, demanding, older sister. His mother was ineffective in providing structure and guidance and discouraged close physical contact between herself and the boy. The fact that the mother brought the infant sibling to the clinic and took him with her during the separation period increased the boy's problems concerning separation. His usual behaviour at separation was an increase in motor activity.

Subject 8 was unlike the other children in that she showed increased skin temperature on separation and a decrease in temperature on her mother's return.

The relationship between the mother and child was characterized by frequent struggles for control. The child consistently tested the limits which the mother sought to impose on her behaviour. The mother was unsure of herself in maintaining the control she imposed. Her conflict in coping with the child's reactions manifested itself by evidence of increasing irritation with the child, flushing of her face and uncertainty over whether or not to act. When other devices failed, the child would increase her testing to the point where the mother was forced to take action. When the mother acted, the child continued to control by indicating urgency to urinate. She attempted this device repeatedly and the mother was unable to curtail this activity or to realize with surety that the child had no real need to urinate. The child attempted this same pattern of behaviour in the separation room with the observer. The mother co-operated well with the instructions given her for effecting and maintaining separation. The observer was gentle but firm in maintaining the limits on remaining in the separation room. Under these conditions the child attempted to gain return to her mother by claiming an urgent need to urinate. On session V, after repeated demands to go to her mother were seen to be ineffective, she pulled up her dress and challenged the observer saying: "I'm going to pull my pants down and go right here". When this challenge did not alter the situation she continued to threaten to urinate on the floor as before. These threats gradually became less vigorous and she began to cry softly as the observer verbally recognized her feelings. The child first ignored the observer but soon, with decreasing resistance, began to imitate his play activities. Under these conditions her skin temperature rose from below the norm to 0·5°C above the norm.

The immediate skin temperature responses to separation in this child were characterized by moderate increases in skin temperature. Although she could have opened the door to the observation room and gained exit had she chosen to do so, she appeared to need the observer's verbal sanction in order to leave. Thus, suppression of action was evidenced but action to structure and control her immediate environment was pronounced. The reductions in skin temperature which occurred on the mother's return were associated with a return to strong control efforts by the child. These interactions with the mother were characterized by the lack of structure given them by the mother who, at these times, had to act without the benefit of experimental instructions. Under these circumstances the mother again showed her uncertainty and irritation with the child, and the child's efforts to control the mother were effective.

Only three children showed reductions in skin temperature on return of the parent that could be regarded as possibly significant. The average magnitude of the drops in skin temperature on return was 0·28°C as compared with an average fall on separation of 0·55°C. In those children who showed consistent falls in skin temperature on the parent's return, the change was regarded as being related to feelings specific to the individual children. These feeling states were, for Subject 5, guilt and fear of discovery; Subject 8, the re-arousal of conflict in the struggle with the mother for control; Subject 9, the frustration experienced by the child over having a pleasant, ongoing activity interrupted. Generally associated with falls in skin temperature on return were general states of excitement.

Separation from the parent produced more marked and consistent falls in skin temperature early in the series of sessions and diminished as the child became accustomed to the procedure. The characteristic reaction of the children showing this response was one of initial protest with crying, clinging to the mother and active

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refusal to separate. When these efforts failed, either weeping continued and efforts were made to seek help from the observer to restore the mother, or aimless behaviour ensued. This was often followed by the expression of anger toward the mother in either a direct or indirect manner. When these reactions occurred within one session, the skin temperature continued its decline or showed poor recovery.

Skin temperature response to inoculations

In one experimental session the stressful situation was an inoculation. The procedure involved the verbal preparation of the child for inoculation following which a measurement was made. After the injection another measurement was taken. The procedure was observed through a one-way mirror.

Table 2 shows the skin temperature responses of the children under the above conditions. The tabled values show each child's habitual skin temperature level expressed in °C deviation from the group norm and the deviations from the individual norms for the experimental conditions. Anticipation of the injection was associated

TABLE 2.—HABITUAL SKIN TEMPERATURE LEVELS AND SKIN TEMPERATURE RESPONSES TO INOCULATION

Subject	Deviation from group norm (°C)	Deviation from subject norm (°C)	
		Before injection	After injection
9	+1·49	−4·01	−3·01
7	+1·24	−0·07	+1·23
3	+0·57	−0·40	+1·10
5	+0·18	+1·91	+1·89
2	+0·14	+1·03	+0·33
4	−0·07	−1·34	−0·16
8	−0·16	−0·20	+0·73
6	−0·17	−1·44	+0·14
1	−0·22	−1·48	+0·18
10	−0·06	—	—
11	−0·37	—	—
Mean		−0·64	+0·27

with skin temperature falls below the preceding level of measurement in six of the nine children. The average skin temperature during this period for all children was −0·64°C below their usual norms. The measurements taken following inoculation showed that seven of the children had increased skin temperature sufficient to produce an average post-inoculation skin temperature level 0·27°C above their norms.

Subjects 2 and 5 were exceptions to the general reaction pattern of the group to this procedure. Subject 5 showed moderate apprehension while anticipating the inoculation but reacted minimally during and following its administration. The mother was (usually) punitive and controlling in her relationships with the child. During the inoculation procedure the mother laughed at the child's

discomfort and following the injection called the child's attention to "the big hole in your arm". The child responded to the mother's remarks by expressing affection for the mother. Her reaction to this procedure was consistent with her usual pattern of behaviour which sought maternal love and affection through self-denial and by adopting a self-punitive attitude. Subject 2 was a compulsive boy who responded to anxiety with constricted behaviour and increased compulsivity. He carefully adhered to the demands placed upon him by his parents. He was apprehensive before the inoculation procedure and attempted to take action to prevent it. He cried as the injection was about to be given. His mother, a very controlling woman who demanded complete obedience, moved quickly to restrain the boy so that the injection could be given without difficulty. This behaviour was consistent with the mother's pattern of interaction with the boy. Rigid adherence to the behaviour standards of both parents was expected of the boy and he was never allowed to deviate from these requirements. Following the injection the boy cried briefly although attempting to suppress this response. He stroked his arm in an effort to comfort himself while looking angrily at his mother. The mother gave him no comfort or sympathy. Under these conditions his skin temperature fell from its previous level.

Subjects 2 and 5, in addition to showing similar skin temperature responses to this procedure, were alike in the following respects. Both children subjugated their own needs to those of their parents. They both conformed rigidly to the wishes of their mothers. Both mothers customarily took a punitive, controlling attitude toward their children. In addition, they were usually unsympathetic and took little cognizance of their children's needs. Subject 2 was the product of a forced marriage. The birth of Subject 5 had caused the father to terminate his college career.

The relationship of skin temperature responses to maternal behaviour

An analysis of the data was made in order to determine the relationship, if any, between the skin temperature responses of the children and the concurrent behaviour and attitude of the mothers. To accomplish this analysis each response which was 1·0°C above or below the norm was selected for study. The co-ordinated behaviour records were then examined to determine the predominant characteristics of the mother's behaviour just prior to each of these measurements. Those instances which provided relatively clear patterns of maternal behaviour, uncomplicated by interaction with other variables of situation and behaviour, were isolated for analysis. This resulted in analysis of 38 per cent of the total possible situational events.

This analysis revealed that recognition of the child's needs and the expression of comfort and solicitude for the child were associated with warm skin temperatures. The expression of approval with the child's self-directed play was associated with warm skin temperatures, while, though occurring less frequently, an attitude of disapproval occurred with low skin temperatures. Interference with the child's activities by pressing the child to conform or by limiting his ongoing activity was consistently associated with cool skin temperatures. Warm skin temperatures accompanied those interactions which were directed and structured by the child while cold skin temperatures occurred when the mother tried to direct the child.

Relationship of skin temperature responses to child's behaviour

The skin temperature responses in association with the behaviour and attitudes exhibited by the children were studied following the procedures for analysis of maternal behaviour given above. This analysis revealed that constructive play which led to mastery and control over the environmental play situation was frequently associated with warm skin temperatures. When controlling, demanding behaviour led to mastery of the social environment without threat of retaliation, warm skin temperatures occurred. If this behaviour led to increased threat from the social environment, low skin temperatures were predominant. In response to direct social

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pressures wherein the child successfully avoided or evaded the demands made on him, warm skin temperatures resulted. Lack of success led to cool skin temperatures. Warm skin temperatures accompanied dependency seeking behaviour which was appropriately responded to by the mother.

The verbal expression of fears was consistently associated with low skin temperatures. Cool skin temperatures were found to accompany generalized anxiety, fear following real injury, and hostile-aggressive impulses acted out through fantasy play. The expression of hostile-aggressive behaviour against the social environment resulted in a mixed picture with both warm and cold skin temperatures occurring in either an accepting or non-accepting social situation. Anger in association with the restriction of motor activity resulted in low skin temperature in one instance.

Case illustration

Detailed descriptions of the skin temperatures responses and associated behaviour and situation for individual children, on separate sessions, are presented below to illustrate some of the relationships observed.

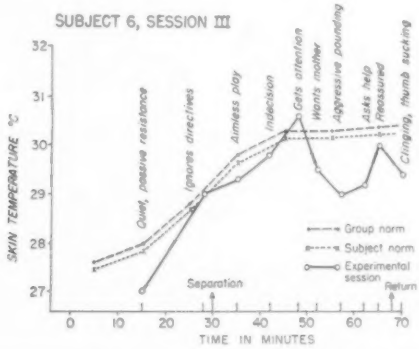

FIG. 2.—Skin temperature during period of life stress: hospitalization of mother and adjustment to mother substitute.

Fig. 2, for Subject 6 on Session III, illustrates a session characterized by relatively low skin temperature levels. The previous day the child's mother entered a hospital for minor surgery. The child was cared for in her own home by the maternal grandmother, who brought her to the clinic for the experimental session. The grandmother was unfamiliar with the pattern of free play usually allowed the children in the playroom and repeatedly attempted to have the child maintain the room in order. The child did not comply with these requests. She was quiet and restrained in her play and lacked her usual bright spontaneity. Prior to the first and second measurements she was resistant and inattentive to the grandmother's repeated requests for her to replace toys. Separation was easily effected. Prior to the third and fourth measurements she was unusually quiet. Although she made overtures to the observer for his help in conducting her poorly organized activities she had difficulty in expressing this need. Prior to the fifth measurement she asked the observer to read to her. She responded with increasing spontaneity and appeared more at ease as this was done. Prior to the sixth measurement she heard an infant crying elsewhere in the clinic and remarked: "That baby needs its mommy". Following this remark her behaviour became baby-like and she asked the observer, using less mature speech, to "play baby games with me". Prior to the seventh measurement she became serious and began to talk of a recent illness. She related how her father and mother had taken care of her. She then quickly turned to the pounding board and began to hammer it vigorously. She appeared disturbed, interrupted her activity, and asked the observer to do it for her, at the same time admonishing him to be careful not to hurt himself. The eighth measurement occurred at this point.

Following this measurement she sat at the table and coloured quietly. She again became disturbed shortly thereafter upon finding that her hands were stained by the crayon. She was reassured that this was all right and the ninth measurement was then taken. The grandmother returned prior to the final measurement. The child approached the grandmother, held her grandmother's dress, and began to suck her thumb while her facial expression changed to one of sadness.

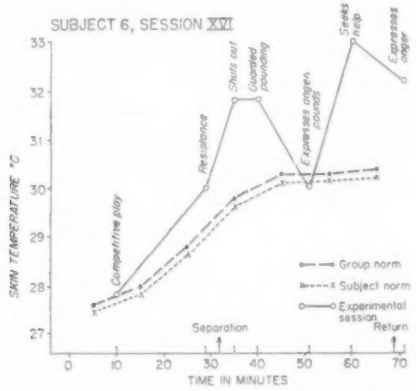

FIG. 3.—Skin temperature responses during session characterized by possessive and competitive behaviour, passive resistance and displaced aggressive behaviour.

This child's responses on Session XVI (Fig. 3) are in marked contrast to those for Session III. The home conditions at the time of this session were not unusual. In her psychiatric interviews the mother had repeatedly voiced concern regarding the child's lack of opportunity for congenial peer play in their neighbourhood. Prior to the first and second measurements the mother had cautioned the child regarding her play with other children in the room. The child was aggressively competitive in her play with the other children and was successful in maintaining dominance over them although the mother continued to press her to be more considerate in her play. The child ignored the mother's directives to this effect and directed sullen glances at the mother when she was not taking action directly with the other children.

The third measurement was taken after the mother had left the child in the separation room. The child had determined that the mother had left the adjoining hall and then closed the door to the separation room and secured it with a door stopper. The fourth measurement followed guarded, restrained pounding on the peg board. The guarded pounding abruptly gave way to vigorous pounding which was accompanied by derogatory remarks about her mother. Speech clarity deteriorated as she continued to express angry thoughts about her mother. The fifth measurement was taken at this point. Following this measurement she became less active and asked the observer to play checkers with her. She controlled this activity by making up rules which gave her advantages in the game. Throughout this interaction the observer was permissive and accepting. She then began to make remarks which sought clarification of "good" and "bad" behaviour. The observer pointed out that little girls sometimes had a hard time knowing what was good and bad. She then began to express her feelings about her parents more openly. She stated that she believed her parents were not good to her and implied that when she felt this way she also wanted to be bad. The sixth measurement was taken at this point. Final measurements were taken shortly after the mother's return. At the mother's entry the child moved closer to the observer and protested the mother's suggestions that it was time to go home.

The relatively high skin temperature for this session occurred with resistant behaviour which appeared to be associated with underlying feelings of resentment toward the mother. The early, moderately warm skin temperature rose to high levels as the child showed guarded behaviour. With the expression of anger in words and actions her skin temperature fell sharply. A return to very warm skin temperature occurred in a permissive, accepting environment in which the child sought clarification of her feelings.

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Sessions XIV and XVI illustrate cold and warm skin temperature responses as they appeared in Subject 7. This girl was relatively inactive and relied heavily upon fantasy play. The mother insisted on a close relationship with the girl and consistently structured and guided her activities. During the course of the investigation the girl sought to become more independent and to emancipate herself from the mother's protective envelopment. While showing evidence of a desire to originate and

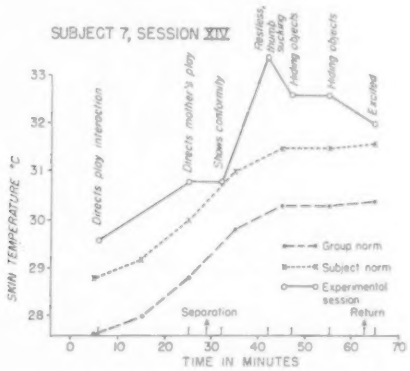

FIG. 4.—Relatively warm skin temperatures occurring during life period characterized by maternal recognition and acceptance of child's needs.

pursue her interests, she was unable to resist the mother's efforts to initiate activities with her. She would accede to the mother's structured play activities dutifully but would show signs of irritation, discomfort, and less maturity in those instances. With psychiatric help, beginning at the fourth session, the mother gradually became better able to give the child greater independence and freedom of action. This was difficult for the mother and she continued to show ambivalence in her conduct with the child. Before the eleventh session she was able, though reluctantly, to enroll the child in a nursery school. Between the fifteenth and sixteenth sessions the mother removed the child from the nursery school and showed signs of increased disturbance over the child's growing independence.

At home, throughout the investigation, the child persisted in immature, ritualistic behaviour designed to control her parents. She was observed to show disturbed behaviour when seeing her mother express love for her infant sister. She was, however, unable to express these feelings through direct action. Her habitual skin temperature level was above the norm (Table 2).

Fig. 4 illustrates this child's skin temperature responses to the events and behaviour of Session XIV. Her skin temperatures on this session were elevated above her individual norm. She was comfortable and happy during the interactions with her mother. She initiated activities with the mother who, contrary to her earlier behaviour pattern, followed the child's directions rather than attempting to structure the situation for the child. Prior to the first and second measurements the child pretended to have a tea party with the mother. In this activity the mother made fun of the younger sister by imitating the sibling's messy feeding habits. The subject responded to this with laughing and signs of pleasure. During these measurements it was noted that her musculature, usually hard and tense, was soft and relaxed. Following an easy separation the child asked the observer to read to her. This activity was one which the mother had frequently forced on the child. The third and fourth measurements preceded and followed the reading respectively. During the reading the child moved about restlessly, sucked her thumb and appeared uncomfortable. Following the reading she initiated a game in which she hid objects from the observer. The fifth and sixth measurements were made during this activity. The mother returned prior to the final measurement. The subject greeted the mother in a warm but excited manner and quickly began to relate the play experiences which had been pleasurable to her.

Session XVI, Fig. 5, occurred following termination of the child's nursery school enrollment. During this session she appeared excited, showed muscle tension and jerky, poorly co-ordinated movements. Prior to the first measurement the child had participated with the mother in play activities directed by the mother. Prior to the second measurement the child was disturbed by the presence of other children in the playroom. She stopped her own play, avoided interaction with the

other children and withdrew to her mother where she stood sucking her thumb while holding her mother's arm. The mother gave her comfort and reassurance but did not encourage her to leave and participate in peer play. Following separation she changed activities and interest quickly. She showed great interest in a toy knife and gun. While manipulating the knife she enquired: "This knife isn't the kind that will hurt anybody, is it?" Following the observer's response pointing out her uncertainty about the knife she put the knife aside and began to tell of a recent trip she had taken with her mother. She remarked on the places seen and the activities she and her mother had engaged in

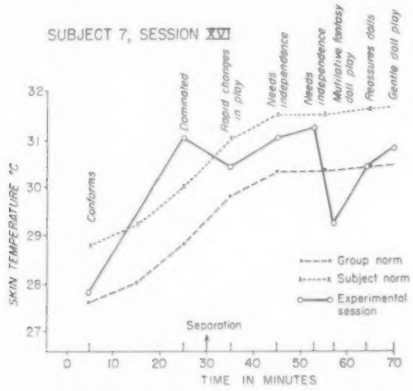

FIG. 5.—Relatively low skin temperatures occurring during life period characterized by maternal failure to recognize and meet child's needs.

and at the same time implied that it had been tiring. When the observer suggested that it was sometimes hard for little girls to sit still for a long time she replied. "It sure is—I got awfully tired of it". The third measurement was made at this point. Prior to the fourth measurement she talked of her nursery school experiences and told of a boy who was her friend there. She stated that he was a "big person" and that he was going to give her a ring. Then, with determination, she added: "And I'm going to give him one, too". She then asked the observer how he liked her clothes, while posturing to show her blouse. In this context she informed the observer that she was to have her fourth birthday soon and added that her small girl friend was already 4 years old: "she's been 4 years old an awful long time". The fifth measurement was preceded by idle doll play followed by pounding on the peg board. In this pounding activity she hit her finger, displayed it proudly to the observer, then carried on with her pounding in a manner implying her capability of engaging in this activity. Prior to the sixth measurement she engaged in fantasy play in which she aggressively mutilated a girl doll with the toy knife and gun. During this activity she vocalized as follows: "I'm going to pretend to kill you . . . you're a bad doll . . . you killed somebody I like". Following this measurement she turned to play with a boy doll and pretended to cut off his ears. As she did this she became excited and engaged in a flurry of mutilative activity with the doll which was terminated by her turning to a small baby doll on the shelf and while mothering it said, "I'm not going to kill you . . . you're my baby". The seventh measurement was taken at this point. Before the final measurement she had become calmer, appeared more relaxed, and was caring for small dolls in a motherly manner. She turned to the observer and remarked: "My stomach feels awful warm". The mother returned at that moment and the child went quietly to lean against the mother, who caressed her.

The skin temperature responses of Subject 1 during Session IX illustrate warm and cold skin temperature responses occurring to a marked degree within the same session (Fig. 6). This subject was a disturbed, hyperactive boy whose habitual skin temperature level was below the norm (Table 2). He was extremely competitive with, and threatened by, an infant male sibling. The mother was irritated with the boy's constant hyperactive behaviour but did not act effectively to set limits on it.

The separation situations were particularly disturbing to him since the mother took the infant sibling with her during such times. On Session IX (Fig. 6) he was negative and resistive to the mother's efforts to control his active behaviour. He called people derogatory names which irritated the mother. The first measurement was taken during such behaviour and just after he had threatened to strike the

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observer. Prior to the second measurement the mother had changed her attention from the baby to read to the boy. The subject responded well to the story, which was about a small boy who was much like the subject in his behaviour. He voiced his pleasure with the reading and the mother responded warmly to him. His skin temperature at this point had accelerated sharply to reach a point 2·0 C above the norm. Separation was easily effected, but prior to the third measurement the boy had shown unusual conformity in that he carefully tended the secretion from his nose and disposed of the tissues neatly. His mother customarily had carefully seen to this and the boy had habitually neglected

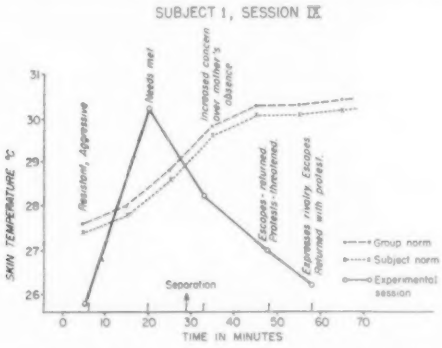

FIG. 6.—Skin temperature responses to separation from mother under conditions of insecure mother-child relationship, sibling rivalry and threat of punishment.

this on previous occasions. Prior to the fourth measurement he left the separation room in an attempt to go to his mother. The mother returned him despite his active, assaultive protests. The mother was unable to leave the boy and finally in exasperation threatened physical punishment. Measurements were taken when the boy accepted separation under these circumstances. After this point he increased his limit testing. He then commented: "my baby brother can't have these things done to him (indicating the Dermalor) . . . I don't want him to". He then slashed the desk and wall with the toy knife in an angry manner as measurements were taken. Following these measurements he wiped his nose repeatedly with tissues which he dropped indiscriminately on the desk and floor. He abruptly stated that he wanted to go to his mother and left the room quickly. He was again returned against his protests. The final measurement was taken at this time.

Habitually low skin temperatures were observed in this boy, who was the most anxious and disturbed child in the study. His conflicts and behaviour did not improve during the course of the investigation. As shown in Fig. 6, warm skin temperature was associated with need satisfaction. Low skin temperatures were associated with anxiety and anger evoked by the separation to which the boy reacted by taking action to escape. This action brought further threat and frustration from his environment.

DISCUSSION

The data suggest that separation from the mother is associated with a reduction in skin temperature in the majority of children. Separation did not evoke simple fear of abandonment but elicited complex reactions which varied from child to child. The reactions associated with falls in skin temperature on separation were primarily those of anger and fear. Of these reactions, the expression of anger appeared to be associated with falls of greater magnitude. These findings are similar to those of MITTELMANN and WOLFF (1939, 1943) who reported falls in skin temperature in adult subjects to be associated with anxiety, anger and fear of abandonment.

Appraisal of the data suggests that the relationship between skin temperature changes and associated psychological events and behaviour might be best explained by the formulation put forward by GRACE and GRAHAM (1952) and GRAHAM (1955). These investigators reported that lowered skin temperatures occurred in individuals

who contemplate taking some kind of action. The reduction in skin temperature occurring during reactions of fear and anger is considered by GRAHAM to be essentially preparation for action, which acts to reduce heat loss from the skin in order to raise internal body temperature. GRAHAM worked under conditions in which his subjects did not have opportunity for unlimited action as did the subjects in the present study. Applying this formulation to the present data then, reduced skin temperatures would be expected with reactions of anxiety, fear and anger, since the appropriate responses to these reactions would be action to defend, escape or attack. Conversely, raised skin temperatures would be expected to occur in those individuals who perceived the situation as precluding action, or whose learned patterns of behaviour prevented actions of defence, escape or aggression.

The above formulation is supported by the observations that children who through a need to conform to their parent's expectations were unable to show anger or take adequate defence in a normal fear-inducing situation (inoculation) failed to show falls in skin temperature. Other children who were able to show fear and take defensive action in the presence of their parent showed falls in skin temperature. The children's reactions to separation further support the hypothesis advanced. The more immediate responses to separation were those of resistance or escape. Moderate falls in skin temperature accompanied these reactions. Where these efforts were continued the skin temperature continued low or dropped to still lower levels. Acceptance of the situation by the child was associated with a return to higher, more normal skin temperature levels.

Further evidence in support of the relationship between skin temperature changes and the taking of action is derived from the responses during anger and resentment. Resentment, as used in this study, refers to a reaction characterized by behaviour indicating the suppression of action in a situation where it appeared that the child perceived himself as being treated unjustly, interfered with, or suffering insult or injury. Anger, on the other hand, refers to a reaction characterized by behaviour in which the child overtly acts against the offending agent or substitute. Increased skin temperatures were observed in children who showed resentment reactions and in those who passively accepted demands which were in conflict with their needs. These findings are similar to those reported by MITTELMANN and WOLFF (1943), who found high skin temperatures in their adult patients to be associated with feelings of resentment and undercurrent, murderous impulses. The close relationship between resentment and anger is seen in the observation that resentment, with its raised skin temperature, frequently preceded the expression of anger. When resentment was not followed by the expression of anger the skin temperature continued at raised levels.

The earliest expressions of anger observed were usually tentative, with the child first testing the situation to determine the acceptability of its expression. Moderate falls in skin temperature accompanied such expressions, and with increasing overtness of expression the skin temperature dropped to still lower levels. The magnitude of the fall in skin temperature appeared to be related to the degree of freedom with which the child could express his anger. Termination of the expression of anger was associated with an upturn in skin temperature. This was often preceded by behaviour indicating anxiety in which it appeared that the child was concerned with losing control over the expression of anger. The reaction of anger thus appears not to be a pure reaction, and other feelings, particularly anxiety, are simultaneously involved.

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TALBOTT (1931) has pointed out that lower skin temperatures in children occur with increased physical activity (treadmill). It might be argued that the expression of anger in direct action brings with it a necessary increment in physical activity and thus a lowering of skin temperature. Analysis of the activity records suggests that this factor may indeed be operative. It alone, however, did not appear to be sufficient to produce the marked changes observed when anger was present. Marked falls in skin temperature occurred during anger even though the activity level of the child did not vary.

The high normal skin temperatures observed during states of need satisfaction, comfort, and objective mastery and control over the environment appear to be normal responses to these states and must be differentiated from the high temperatures noted for resentment. The former correspond to the warm skin temperatures found in children during rest and relaxation by TALBOTT (1931). It is apparent that during such states the need for and contemplation of action are not present.

SUMMARY

Skin temperature responses and their associated psychological events were studied in nine children in experimental sessions over a period of several months.

High normal skin temperatures occurred with states of comfort, need satisfaction, and objective mastery over the environment. Increased skin temperature was observed in response to threats productive of resentment for which adaptive actions were not taken. Decreased skin temperature was associated with reactions of anxiety, fear and anger. Of these, the expression of anger resulted in skin temperature reductions of the greatest magnitude. Moderate reductions in skin temperature were associated with preparation for appropriate protective action, while large falls in skin temperature accompanied more overt and concerted efforts for action.

Individual differences in skin temperature responses occurred. These differences are regarded as being determined by the learned experiences of the child and his characteristic modes of response to life situations.

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REPORTS OF MEETINGS

Colloque Consacre aux Problèmes Medicosociaux en Médecine Psychosomatique

Samedi 31 mai et dimanche 1er juin 1958

MM. M. MONTASSUT, L. CHERTOK. Pragmatisme de la médecine psychosomatique.

L'interprétation psychosomatique d'une maladie est souvent complexe. Néanmoins, dans tous les cas, l'attitude et l'action psychosomatique sont intéressantes et souvent efficaces.

La liaison psychiatrique à l'hôpital général, chaînon de la médecine psychosomatique, permet le dépistage et le traitement des composantes psychologiques et des incidences sociales de la maladie physique.

Ceci se traduit par des économies importantes: hospitalisation, opération, instrumentation, médication, laboratoire, temps des médecins et des auxiliaires. A ajouter l'aspect positif: reprise précoce du travail, limitation de l'absentéisme, amélioration du budget et du climat familial, santé mentale du malade et de ses proches.

Enfin le colloque entre le psychiatre et ses collègues est bénéfique pour une connaissance médicale commune. Cette expérience se poursuit depuis près de dix ans au Centre de Médecine Psychosomatique de l'Hôpital Psychiatrique de Villejuif qui a établi des liaisons régulières avec plusieurs services parisiens.

Douze observations, empruntées à diverses disciplines, illustrent ces considérations cliniques, techniques et économiques.

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MM. L. LE GUILLANT, M. PARIENTE. Le dialogue psychosomatique.

L'objet de ce rapport est d'introduire la dimension sociale dans le trouble psychosomatique. Après avoir rappelé l'ampleur des constatations psychosomato-sociales, l'auteur signale leur caractère empirique, leur tendance à la moralisation et au pessimisme. Face à cet état de fait, d'innombrables essais thérapeutiques sont tentés, dont le résultat semble plus probant que les théories qui veulent les justifier. Le temps est venu, par conséquent, d'essayer d'approfondir ces problèmes, de se pencher plus sérieusement sur la "connaissance pratique de l'homme". L'auteur étudie longuement l'attitude de l'école analytique, face à la psychothérapie des malades psychosomatiques. Il constate l'existence—en dehors de la psychanalyse—d'un vide à la fois psychopathologique et psychothérapeutique. Mais le système de références analytiques demeure séparé de la connaissance pratique de l'homme (celle que possède le médecin non analyste). Aussi peut-on se demander si le dialogue psychosomatique existe réellement entre le psychiatre analyste et le médecin. Ce dernier suit-il le psychanalyste dans ses interprétations? Sa compréhension du trouble se trouve-t-elle approfondie ou bien s'en remet-il au psychanalyste par soulagement, pour que celui-ci s'occupe d'un domaine qui reste étranger au médecin traitant?

L'introduction de la dimension sociale, l'étude des névroses professionnelles par exemple, les données statistiques opposées au cas individuel, peuvent modifier les données du dialogue. Justement ces névroses ne peuvent être comprises que comme un fait collectif.

Les conditions modernes d'existence, l'organisation du travail, sa durée, son intensité, sa qualité donnent lieu à des modifications à la fois psycho- et physiologiques.

Aussi la dimension sociologique, sans chasser l'individuelle, ouvre de nouvelles perspectives de recherche.

MM. R. HELD, M. SAPIR. Quelques aspects sociaux de la médecine psychosomatique.

Les conflits actuels, concrets, en rapport avec le milieu peuvent réactiver des conflits intériorisés au cours des premières années de la vie.

Des conflits ont pu naître au tout début de la vie, avant la maturation complète du néo-cortex et laisser ainsi des empreintes dites archaïques. De là peuvent dater des intégrations viciées et des troubles de la coenesthésie. Une symbolisation beaucoup plus tardive des organes troublés peut survenir créant un cercle vicieux, bien connu. Ainsi pourraient s'expliquer les localisations de

troubles fonctionnels à un organe ou un système. Mais des facteurs purement tissulaires, des éléments constitutionnels ont pu jouer aussi. Il est difficile de déméler la part causale revenant à chacun de ces facteurs.

Plus tard des aggressions polymorphes vont jouer: celles dûes à l'attaque organique et à l'agression par le milieu. Ce dernier intervenant doublement: (1) objectivement d'abord par les privations et tensions réelles; (2) par la représentation que l'individu en a.

Autrement dit, sur des empreintes du passé, sur un être historique dont l'histoire à la fois biologique et sociale se rattache à celle des parents, la vie quotidienne va influer. Cette influence sera complexe, faite de tensions objectives dûes à la vie moderne, à ses influence sensorielles, dues aussi aux besoins instinctifs et à leur privation et, enfin, aux besoins relatifs, en fonction d'une époque, de son niveau technique et culturel, de son idéologie, de ses luttes.

La plupart des cliniciens sont d'accord sur l'unicité des stress, des motivations; le facteur sociologique collectif—qui peut être étudié—a donc une grande part dans la maladie dont la racine plonge dans les premiers âges de la vie.

L'investigation clinique se modifie actuellement par une meilleure compréhension des rapports médecin-malade, mais aussi par la notion des recherches psychosociales et par les changements dans la structure de la société. Ainsi la sécurité sociale. La nécessité du dialogue à trois.

MM. M. Bolgert et Soulé. Sur l'importance de l'enquête psychosomatique dans les dermatoses et sur les difficultés d'ordre pratique qu'elle soulève en raison de l'organisation actuelle des services hospitaliers.

L'auteur souligne l'importance du facteur psychologique surtout dans le psoriasis, mais aussi l'eczéma, la pelade, les lichens plans, de nombreux prurits. Le facteur psychique peut avoir une valeur étiologique, comme dans le psoriasis, ou jouer le rôle d'élément second, comme dans l'eczéma.

L'interrogatoire long et répété, d'intention analytique, accompagné si on peut d'explications et d'une psychothérapie de surface est indispensable. Il peut être conduit par le dermatologue lui-même, s'il est bien averti de ces problèmes. Il permet notamment de classer les malades en: (a) névrotiques justiciables d'une analyse véritable; (b) d'autres ayant besoin de psychothérapie; et (c) d'autres enfin pour qui des conversations plus ou moins rapprochées peuvent suffire.

La thérapeutique psychique doit avoir lieu dans le cadre du service de dermatologie. Les conditions actuelles de fonctionnement ne s'y prêtent que très mal. L'auteur propose entre autres remèdes l'introduction de psychologues en nombre suffisant dans les services de médecine.

Mlle. S. Lambergeon. Comparaison de consultation psychosomatique de dermatologie en milieu hospitalier, psychiatrique et non psychiatrique, en clientèle privée et en dispensaire.

L'auteur examine les problèmes posés par deux groupes de malades: les uns venant pour un traitement psychothérapique, les autres venant pour leur dermatose. Chez ceux qui—ayant fait leur tri eux-mêmes—acceptent de venir à l'hôpital psychiatrique, les résultats sont très bons dans l'ensemble. Ceux au contraire venant pour un examen psychosomatique dans un hôpital 'général' ont leur tendance à la dépendance ou à la révendication réactivée par les conditions déficientes du travail. Au dispensaire ou dans le privé, l'attitude est ambivalente.

M. H. Lefebvre. Langage et expression des besoins.

L'auteur essaie de restituer en parlant du langage l'unité du psychique et du psychologique l'unité de l'organisme et de ses conditions de vie. Le langage est forme et non substance. Il est un reflet. L'auteur critique d'ailleurs les schématisations faites à propos de la théorie du 'reflet', il insiste sur l'activité créatrice et productrice de la nature humaine, et expose un aperçu dialectique et historique du langage.

Il y a d'abord le mouvement incessant de l'expression—signification. On s'exprime à travers les objets, mais que veut signifier celui qui s'exprime? Celui qui parle, qui est-il? Un être de besoins. Le but est la satisfaction du besoin, la jouissance. Et si l'être a besoin de communication, il y a aussi communication des besoins. Ceux-ci se rattachent au moi. La subjectivité croissante ne va pas sans objectivation croissante comportant la socialisation et la verbalisation des besoins cachés.

L'auteur examine les notions d'instinct et d'inconscient et constate que le langage change le besoin d'en soi en pour moi. La réalisation du besoin comporte à la fois une prise de conscience et son expression. Si celles-ci n'ont pas lieu—le besoin est aliéné, il y a frustration. Au contraire, si le besoin est correctement formulé, mais insatisfait, il y a privation il serait plus normal par conséquent

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d'orienter la frustration vers la conscience de la privation—plutôt que vers un accomplissement fictif (l'auteur vise ici l'opération de transfert).

A partir de là l'étude par le sociologue de la pression constante des besoins dans le monde moderne rend compte de faits étudiés par le psychologue, tels l'angoisse, l'agressivité.

L'analyse des besoins par le langage est réelle, douloureuse. Les conflits sont multiples, tels ceux qui opposent le moi réel et l'image du moi. Ils peuvent cependant être normaux, à condition d'en avoir une solution consciente. "Ma liberté" et "ma vérité" s'obtiennent par apprentissage, par erreurs surmontées. Le dépassement implique le non blocage, la non adaptation d'un système verbal ou symbolique comme solution d'un problème vital. Car ce système mène à l'aliénation.

Dès sa prime enfance, l'individu rencontre des obstacles réels. Le conflit intérieur est alimenté par le milieu. Le moyen de notre développement est aussi cause de notre aliénation. La pression du milieu verbal nous poursuit de la naissance à la mort. La répétition est une aliénation. Or la recherche psychanalytique s'appuie sur la reminiscence, la répétition.

Si l'auteur est d'accord sur la nécessité de débloquer la situation, de raviver les besoins et leur trouver une issue, il s'oppose au langage total de Lacan. Le problème fondamental est celui des rapports entre le sujet réel et son langage ou son silence, entre ce langage et le langage structuré commun à tous.

M. P. Chombart de Lauwe. Milieu social et médecine psychosomatique.

Sans négliger les facteurs constitutionnels, l'auteur étudie les éléments du milieu social qui influent sur le comportement.

Le milieu social est soumis d'abord à l'analyse de ses variables, puis à celle des comportements dûs à un milieu ou à un groupe. Les comportements eux-mêmes sont motivés par des besoins et aspirations analysés à leur tour.

L'étude des comportements sociaux peut se faire d'après des échantillons pris dans des populations de manière différente suivant les milieux sociaux et les comportements étudiés.

L'étude de sociologie active des cas individuels et les rapports médecins-malades:

L'observation du milieu social peut nous permettre non seulement des études sur échantillons mais de comprendre en profondeur des cas individuels. La possibilité de situer un malade dans son cadre de vie en tenant compte de tous les éléments de sa vie quotidienne actuelle et de ceux des milieux sociaux dans lesquels il a vécu auparavant, permettent d'établir entre lui et le médecin des rapports vrais qui ne sont plus purement inter-individuels.

D'autre part, en posant des questions à l'homme sur son milieu social et toutes les attaches qui le retiennent à son entourage, on l'amène à prendre conscience de sa situation et on lui donne la possibilité de s'en libérer. Il y a là une nouvelle maieutique dont l'étude du milieu social peut permettre de définir les bases.

A travers ces différentes études, nous voyons donc que le travail des sociologues n'aboutit nullement à montrer les homme emprisonnés dans des déterminismes sociaux, mais au contraire à les aider à se libérer en prenant leur juste place dans la vie sociale en fonction de leur vocation.

Un double problème pratique se pose alors: d'une part, des sociologues devraient se spécialiser dans des recherches orientées ver la médecine psychosomatique au sens le plus large, d'autre part, un enseignement général de sociologie comportant moins de vues théoriques abstraites qu'une éducation de l'observation de la vie sociale, serait absolument nécessaire pour les jeunes médecins. A cette double condition de larges perspectives de travail s'ouvrent aux équipes qui se consacreront aux recherches sur les rapports entre la maladie et la vie sociale.

Mme. M. J. Chombart de Lauwe. Liaisons entre certaines variables et des troubles bien définis du comportement chez l'enfant.

Ainsi, nous avons essayé d'observer, par exemple, quelles variables du milieu sont susceptibles d'agir sur les manifestations psychomotrices: instabilité psychomotrice, hypernervosité, etc., de l'enfant. Nous sommes partis d'une enquête très large portant sur l'ensemble des enfants suivis pour troubles du comportement en 1954 dans 32 consultations spécialisées de la Seine. Les enfants débiles, présentant des troubles organiques, ou ceux qui avaient plus de 14 ans, ont été éliminés. Nous avons alors regroupé tous ceux dont les difficultés s'exprimaient par des troubles psychomoteurs.

Avant d'essayer de croiser les variables du milieu avec ce type de trouble, il nous a semblé prudent de connaître l'interaction des variables entre elles, pour ne pas attribuer à l'une l'action de l'autre.

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D'après nos études antérieures, nous avons choisi cinq variables principales qui nous semblaient de première importance (les quatre premières portent sur la famille où vit l'enfant, la cinquième intéresse seulement l'enfant): (a) la catégorie socio-professionnelle du père (ou de son remplaçant); (b) la composition de la famille (avec qui vit l'enfant); (c) le surpeuplement du logement; (d) le travail de la mère (ou de sa remplaçante); (e) le nombre de changements de milieux familiaux où l'enfant a vécu.

Il est alors possible de définir les caractéristiques sociales du groupe d'enfants atteints de troubles psychomoteurs, par rapport à l'ensemble des enfants atteints de troubles du comportement. Des comparaisons avaient été faites antérieurement entre quelques caractéristiques sociologiques de cet ensemble et de la population de la Seine.

On remarque une forte proportion d'enfants atteints de troubles psychomoteurs dans les catégories socio-professionnelles les plus défavorisées et les logements les plus surpeuplés. Quand ces deux variables atteignent leurs plus bas niveaux, les troubles psychomoteurs sont dominants et leur fréquence décroit progressivement avec l'élévation de ces niveaux. Du point de vue de la composition de la famille, c'est lorsqu'il y a mésentente et disputes entre les parents que les troubles psychomoteurs sont les plus fréquents, puis lorsqu'il y a divorce. Nous analysons ainsi les liaisons entre un type de trouble et diverses variables et pouvons comparer les aspects de plusieurs types de troubles différents.

M. J. Maisonneuve. Les relations socio-affectives et leur méthode d'approche.

Les relations socio-affectives comprennent à la fois les relations familiales, amicales et sociales, ces dernières étant liées au statut et au rôle des sujets dans les divers groupes dont ils sont membres. L'isolement, l'exclusion, la marginalité, les situations de rivalité ou d'insécurité, s'accompagnent de troubles variés de la personnalité, dont certains peuvent présenter des corollaires somatiques. Il est donc important de déterminer le champ et le style socio affectif des sujets.

Les relations intra-familiales sont difficiles à saisir directement. On peut recourir aux entretiens (avec les divers membres de la famille) et aussi au psychodrame et aux tests projectifs.

Pour les relations amicales nous avons établi un questionnaire de "constellations" permettant de connaître le nombre et les caractéristiques sociales d'un large échantillon d'individus appartenant à divers milieux sociaux—ce qui conduit à dégager certains facteurs d'affinitiés.

Par ailleurs, l'enquête sociale permet de saisir le degré d'intégration des sujets et de leur famille dans leur environnement social. On constate ainsi combien fréquemment le déracinement et le marginalisme sont liés aux névroses ou aux déséquilibres. C'est ainsi que, dans 40% des cas, des "handicaps sociaux" divers sont significativement liés aux diagnostics de déséquilibres psychopathiques.

Le style actuel de sociabilité des malades peut aussi être éclairé dans le cadre même du groupe hospitalier, d'une part à l'aide d'une *enquête sociométrique* (par entretiens individuels successifs), d'autre part par des *séances de discussions collectives libres*. La première permet la construction du sociogramme du groupe—sorte de radiographie socio-affective, révélant les status et les liens des divers sujets; les secondes, conduites dans un esprit non-directif, permettent une observation des attitudes des interactions et des rôles dont la prise de conscience par les sujets eux-mêmes peut, sous certaines conditions, posséder une valeur psychothérapeutique.

M. C. Veil. Médecine de travail et psychiatrie.

La psychiatrie du travail, surspécialisation récente, offre d'excellentes possibilités de coopération amicale entre médecins de différentes disciplines, d'insertion de la psychiatrie dans une activité préventive spécialisée, et satisfait une demande de prestations médicales dans la mesure où justement les besoins et les connaissances croissent simultanément. La déontologie de la profession est précisée.

M. C. Leroy, Mme. Colpaert. Le médecin conseil et la médecine psychosomatique.

Examinant les travailleurs d'une entreprise, l'auteur trouve que 70% au moins des sujets présentent des affections psychosomatiques. Celles-ci sont très diverses—les plus nombreuses sont les affections digestives, les névroses cardiaques, les ulcus et les lombalgies. L'auteur envisage ensuite la formation du médecin-conseil et ses rapports avec le médecin traitant.

M. R. Hazemann. La notion de liberté dans l'habitation.

L'auteur étudie les rapports entre l'habitat et l'incidence des maladies psychosomatiques. Il critique les normes actuelles de la construction. Le foyer ne constitue pas seulement un abri physique.

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Le logement populaire est trop petit, les blocs d'immeubles trop grands, on en arrive ainsi à la notion de "taudis neufs" qui ne sont ni à l'échelle de la famille, ni de l'individu. Le sentiment de liberté, les possibilités d'une discipline auto-consentie, ne sont pas possibles dans ce cadre. A la promiscuité de l'appartement s'ajoute un monde sans pesanteur sociale d'immenses immeubles qui ne sont plus à l'échelle humaine.

Mme. H. Michel Wolfromm. Perspectives médico-sociales en gynécologie psychosomatique.

40% des troubles génitaux sont d'origine psychogène (statistiques personnelles), 20 à 50% (selon les auteurs). Le rôle du psychosomaticien—gynécologue est triple:

(1) Action individuelle: (a) il dirige les cas graves sur le psychiatre et s'occupe lui-même des cas légers, ce qui présente beaucoup de difficultés tant en clientèle privée qu'à l'hôpital; (b) il diagnostique et traite les cas plus simples.

Ainsi l'auteur trouve 71% de lésions anatomiques dans les algies pelviennes, 68% de dysménorrhéiques présentaient une douleur d'origine mixte organique et psychique. Les erreurs en cette matière sont fréquentes et l'interview psychosomatique n'exclut pas les investigations les plus minutieuses. Les facteurs sociaux pathogènes semblent d'une grande fréquence: exiguité du logement, maternités successives, inadaptation professionnelle et transplantation. L'auteur évoque à ce propos le problème anti-conceptionnel.

(2) L'action hospitalière est entravée par la disposition des locaux, la promiscuité, le bruit, l'absence de notion de psychologie médicale du personnel traitant et auxiliaire.

(3) L'action politico-sociale, c'est la lutte pour l'habitat décent, la réorganisation des hôpitaux, la création de véritables services sociaux, pour les moyens anticonceptionnels, pour l'enseignement de la psychologie médicale et l'humanité des rapports.

M. S. Pelage. De la focalisation chirurgicale délibérée comme thérapeutique de certains états psychopathiques.

M. D. Kissen. Facteurs psychologiques spécifiques dans la tuberculose pulmonaire.

L'auteur analyse parallèlement les facteurs psychiques dans le début de la tuberculose, sa rechute, la personnalité de base du malade et l'incidence de maladies psychosomatiques associées. Après avoir constaté dans tous les cas l'énorme besoin d'affection, il étudie les indications d'hospitalisation en fonction de problèmes psychologiques, sociaux et organiques.

M. J. Taureo. Les problèmes soulevés en sanatorium par la médecine psychosomatique.

L'auteur opère sur une population de quelques tuberculeuses agées de 16 ans au moins. Le milieu social est varié: prédominance d'employées.

L'interview psychosomatique princeps se situe environ un mois après l'admission. L'interrogatoire est conjugé avec les associations libres. Le matériel obtenu est très abondant. Les tuberculeux paraissent souvent dès l'enfance soumis aux frustrations, 53% de ces sujets considéraient comme mauvaises leurs relations avec le père, et 47% avec la mère.

La maladie, une fois connue, peut servir de défense ou de fuite devant une situation émotionnelle. Le quart des malades est soulagé en arrivant au sana; 10% refusent de le quitter, mais 88% présentent des conflits préexistant à la maladie. Beaucoup de ces conflits sont d'ordre social, liés à des problèmes matériels d'habitat, de travail, d'administration. Il existe également un nombre important de psychonévroses (20–28%).

En couclusion, il faut prévoir à côté du traitement spécifique qui garde tous ses droits, toute une armature psycho-sociale.

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J. Psychosomatic Res., 1959, Vol. 4, pp. 49 to 51. Pergamon Press Ltd. Printed in Northern Ireland

4th European Conference on Psychosomatic Research

THE 4th European Conference on Psychosomatic Research took place in Hamburg from 21 to 25 April 1959, under the Presidency of Professor A. JORES.

Approximately 100 Research Workers took part in the following programme.

Tuesday 21 *April*, 1959

Morning Session: Chairman, Dr. J. BASTIAANS (Amsterdam)

Topic: Principles of Research in Psychosomatic Disorders.

M. PFLANZ (Giessen)—Psychopharmacology.
J. T. BARENDRECHT (Amsterdam)—Psychological testing.
B. STOKVIS (Leyden)—Hypnosis.
J. GROEN (Jerusalem)—General principles.
A. MITSCHERLICH (Heidelberg)—Psychoanalysis.

Afternoon Session: Chairman, Prof. TH. V. UEXKÜLL (Giessen)

F. ASKEVOLD (Oslo)—Methodological considerations.
S. BARTON HALL (Liverpool)—Psychosomatic methods in the recognition of organic disease.
E. DEKKER (Amsterdam)—Allergic and psychological test methods in patients with bronchial asthma.
A. E. MEYER and D. VON ZERSSEN (Hamburg)—Idiopathic hirsutism.

Wednesday 22 *April*, 1959

Morning Session: Chairman, Dr. GERDT WRETMARK (Linköping)

C. RICCI (Livorno)—The E.C.G. in psychotic and psychoneurotic patients; changes during and after neuroplegic and sedative therapy.
H. BLIJHAM (Groningen)—Personal factors in sterility.
R. PIERLOOT (Louvain)—Psychological factors and industrial absenteeism.
P. L. BROADHURST (London)—The place of animal psychology in the development of psychosomatic research.
A. JORES (Hamburg)—Psychotherapy in psychosomatic disorders.

Topic: Constitution in Psychosomatic Medicine

H. FREYBERGER (Hamburg)—Introduction.
LINFORD REES (London)—Constitution and neurosis.
H. HOFF and E. RINGEL (Vienna)—The "Organminderwertigkeit" of Alfred Adler in relation to modern psychosomatic medicine.

Afternoon Session: Chairman, A. MITSCHERLICH (Heidelberg)

R. LAFORGUE (Paris)—Psyche und konstitution in psychoanalytischen sicht.
O. WISDOM (London)—The Concept of constitution.
G. LANGFELDT (Oslo)—The constitutional reaction types in clinical experience.
A. J. COPPEN (London)—Body build of male homosexuals.
R. H. J. WATSON (London)—Constitutional differences between two strains of rats with different behavioural characteristics.

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Thursday 23 *April*, 1959

Morning Session: Chairman, L. VAN DER HORST (Amsterdam)

Topic: Training for Psychosomatic Medicine.

A. JORES (Hamburg)—Introduction.

M. BALINT (London)

J. BASTIAANS (Amsterdam).

A. E. BAERWOLFF (Hamburg)—One year's experience in psychosomatic group training of general practitioners.

W. GRODZICKI (Hamburg)—Problems and difficulties in psychosomatic training.

J. CREMERIUS (Munich)—Problems and difficulties in teaching psychosomatic medicine to medical students.

Friday 24 *April*, 1959

Morning Session: Chairman, DENIS LEIGH (London)

L. VAN DER HORST (Amsterdam)—Constitution and experimental psychopathology.

F. VAN REE (Amsterdam)—Prediction of syndromes under lysergic acid, (LSD-25).

J. PH. THURING (Amsterdam)—Performance on some psychomotor tests under LSD-25.

J. T. BARENDREGT (Amsterdam)—Performance on some objective tests under LSD-25.

J. E. VAN LENNEP (Amsterdam)—Performance on some projective tests under LSD-25.

H. E. PELSER (Amsterdam)—Excretion of 17 hydrocorticoids as an index of adrenal cortical function in patients with bronchial asthma and in healthy subjects.

S. CANEVA (Vicenza)—The problems of perception.

B. ACKNER (London)—Emotional aspects of hysterectomy (a follow-up study of fifty patients under the age of forty).

R. HELLMANN (Hamburg)—Psychic factors in obstetrics.

R. WEST (Wolverhampton)—The place and recognition of emotional factors in the etiology and treatment of chronic non-specific colitis.

Afternoon Session: Chairman, L. CHERTOK (Paris)

P. SAINSBURY (Chichester)—Neurosis and psychosomatic disorders in out-patients.

J. M. VAN DER VALK (Amsterdam)—Comparison of the social setting and behaviour of patients with bronchial asthma, coronary occlusions and healthy subjects.

H. KITS VAN HEYNINGEN (Amsterdam)—Some notes of the biographical anamnesis of patients with coronary occlusions.

M. R. VAN ALPHEN DER VEER AND P. J. WILLEMS (Eindhoven)—Psychosomatic investigations on patients with heart complaints, respectively on a physical and non-physical basis.

E. ROTTINI (Perugia) AND F. ANTONELLI (Rome)—A case of psychogenic hirsutism.

H. G. MANTHEY (Hamburg)—Psychoanalysis of myxoedema (a case report).

A. STENBÄCK (Helsinki)—Hypochondria in duodenal ulcer.

L. VAN DER HORST (Amsterdam)—Psychosomatic medicine and phenomenological anthropology.

M. MITSCHERLICH (Dusseldorf)—The psychic state of patients suffering from Parkinsonism.

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On 24 and 25 April open meetings for students and practitioners were held at the University of Hamburg.

The following lectures were delivered—

Prof. Th v. Uexküll—Giessen.
Die wissenschaftlichen Kriterien in der psychosomatischen Forschung.

Prof. P. Lain Entralgo—Madrid.
Menschliche Gesundheit und menschliche Vollendung, (dargestellt am Beispiel einer Typologie des westlichen Gesundheitsbegriffes von Alkmäon bis zur Gegenwart).

Prof. G. Bally—Zurich.
Das Menschenbild in der Psychotherapie.

Prof. P. Christian—Heidelberg.
Das Menschenbild in der Medizin und seine Wandlungen in der neuesten Zeit.

Date and place of next meeting—Madrid, April 1961.

Research workers desirous of attending should write to the following national representative for information.

Belgium—Dr. R. Pierloot, von Arenberghstraat, 14. Louvain.
Denmark—Dr. Poul Kirketerp, Kommunehospitalet, Horsens.
Finland—Dr. Asser Stenbäck, Fredriksgatan 68a, Helsingfors.
France—Dr. L. Chertok, 22, Rue Legendre, Paris, 17e.
Germany—Professor A. Jores, Eppendorfer Krankenhaus, Martinstrasse, 52, Hamburg 20.
Great Britain—Dr. Denis Leigh, The Maudsley Hospital, Denmark Hill, London, S.E.5.
Greece—Dr. G. S. Philippopoulos, 4, Morris Petraki Street, Athens.
Italy—Dr. Ferrucio Antonelli, 14 Via Selci in Sabina, Rome.
The Netherlands—Dr. J. M. van der Valk, Wilhelmina Gasthuis, Amsterdam.
Norway—Dr. H. Thomstad, Ulleval Sykehus, Oslo.
Spain—Dr. Rof Carballo, Av. E. Dato 8, Madrid.
Sweden—Dr. Gerdt Wretmark, Psychiatric Clinic, Linköping.

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BOOK REVIEWS

PAUL FRAISSE: **Les Structures Rythmiques.** Universitaires de Louvain, 1956. 124 pp., price not quoted

THIS book contains a survey of the literature and a number of experimental studies into the problem of auditory rhythms and their perception. The work is in the tradition of European experimental psychology and, as such, very sound and within its limits definitive. Using as the independent variable in his research design such factors as the spacing of taps, the author has used the perception of rhythm as his dependent variable and demonstrated a variety of functional relationships. The very detailed report is well documented and carefully written and constitutes much the best introduction available at present to the experimental study of rhythm. In his final chapter FRAISSE touches upon the use of rhythm in poetry and music: many readers might have liked this section to be a little more detailed. All in all this is a worthy successor to the previous books in this series.

H. J. EYSENCK

H. J. EYSENCK: **The Dynamics of Anxiety and Hysteria.** Routledge & Kegan Paul, London, 1958. 311 pp. 32s.

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THIS book is the logical successor to the four previous main works of the author and summarizes the relatively vast number of papers emanating from the Department of Psychology of the Institute of Psychiatry over the past few years. The thesis underlying the present work is too well known to require elaboration. The author continues to seek confirmation of his dimensional approach to personality, which has its foundation in learning theory. Further, he sees this approach to personality study as providing "a bridge (within psychology) between the physiological and social sides". In so far as the book forms part of a programme of research and is in the nature of a report is is not easy to read without some acquaintance not only with the author's previous writings, but also with allied work in the field of learning theory.

The presentation is clear and falls essentially into three parts. The first is an appraisal and criticism of learning theory, an exposition of the problem of inhibition and excitation, particularly with regard to the Pavlovian concept that it is central, as opposed to the Hullian, that it is peripheral. The second part deals with the work done in the author's department over recent years, while the third part is somewhat speculative and serves even as an apologia for some of the shortcomings noted in the results.

The chapter on personality and perceptual processes is of particular interest and in it appears, *inter alia*, the first theoretical proposition that the reviewer has come across to explain—in terms of spatial inhibition, the value of cerebral excitants in brain-damaged persons. On the other hand the chapter on socialization and personality is one of the least satisfactory. It is a brief and inadequate resumé of his book *Psychology and Politics*. It does not give a great many experimental findings, is not as well documented as the other chapters and generally has the air of a postscript. The chapter on drugs and personality, though interesting reading, and whilst quoting Shagass's work on the sedation threshold in relation to the personality dimension extraversion-introversion, contains no allusion to the justifiable criticism this work has incurred. The last chapter again is not very rewarding. It contains the remarkable statement "The terms excitant or stimulant and depressant are not used in any very exact sense by pharmacologists". These are perhaps the words with which pharmacologists are most fastidious in their use, and if this is an attempt to hoist the pharmacologist with his own petard, then it is bound to fail. Another statement strangely out of context is the plea that the psychologist and the psychiatrist should be equal ("absolute equality") in the clinical care of the patient but with the psychiatrist retaining responsibility for (to quote) "the *physical* health of the patient".

A final criticism is of the production of the diagrams, some of which are so indistinct as to be difficult to interpret.

In spite of these shortcomings, and whatever the personal bias of the reader, this book should be read by all who are engaged in research in clinical psychology and by those wishing to be in a position to appraise this aspect of modern experimental psychological research.

E. MARLEY

Metabolism of the Nervous System. The Proceedings of the Second International Neurochemical Symposium, 1956. Edited by D. RICHTER. Pergamon Press, London, 1957. 518 pp., 100s.

FOLLOWING the successful First International Neurochemical Symposium held at Oxford in 1954, the organizing Committee arranged a second Symposium held at Aarhus, Denmark, in July 1956, the proceedings of which are published in this book.

As the title implies, the scope of this Symposium was much wider than that of the first, consisting of thirteen main sections which contained a total of fifty-five articles and discussion on molecular structure and morphology, chemical composition and cytochemical localization, the blood brain barrier, electrolytes and nervous conduction, metabolism of nerve, metabolism of the brain *in vivo* and in *in vitro* preparations, energy metabolism and coenzymes, lipids, nucleic acids, proteins, transmittor substances and other pharmacologically active compounds. The wealth of subject matter, illustrating the rapid growth neurochemistry has made within the past decade, is presented clearly and concisely in a series of excellent reviews and individual papers, each one carefully compiled and well documented. Although the main themes are the fundamental aspects of metabolism, the majority of articles emphasize the relationship of the results to the functioning of the tissue. With so many participants of international reputation, selection of individual articles of outstanding merit is not possible. Taken together they present an accurate, factual and up-to-date account of the present status of knowledge and indicate the trends of current thought. The book is clearly an essential to anyone engaged in research upon nervous tissue metabolism, and could with profit be consulted frequently by others in allied disciplines who desire an up-to-date account of work in this field.

The book bears the stamp of careful editing, only one misprint (under Fig. 2, p. 260) being found in 581 pages, and the index is good. The typescript and figures are clear and easily readable. If there is any criticism it might perhaps be directed towards the publishers who fail to inform the reader that the contents of the book are those of an International Symposium until he has reached p. xi. It would be preferable to have this fact printed clearly upon the cover.

P. J. HEALD

Tranquillizing Drugs. Edited by H. E. HIMWICH. The American Association for the Advancement of Science. Publ. No. 46, Washington, 1957. 205 pp., 45s.

THIS book contains a symposium on tranquillizing drugs held at Atlanta, December 1955 under the auspices of the American Association for the Advancement of Science, the American Psychiatric Association and the American Physiological Society. It would appear that one of the main advantages of symposia is that they permit the pooling of knowledge and the discussion of the findings by experts from different scientific and professional fields, thus facilitating cross-fertilization of ideas. This certainly applies to the Atlanta symposium, which dealt with electro-physiological aspects of tranquillizing drug action, metabolic aspects—therapeutic considerations and results. In various parts of the book various phenothiazine derivatives, rauwolfia alkaloids, meprobamate and azacyclonol are discussed and reference is also made to hallucinogenic and allied drugs. A very interesting contribution on electro-physiology is given by MARRAZZI and HART, who use a very promising technique for the experimental study in animals of the effect of drugs on synaptic transmission. Interesting relationships are reported on the effects of adrenaline, amphetamine, mescaline, lysergic acid, serotonin, bufotenin and adrenochrome, which in varying degrees, act as synaptic inhibitors. This inhibiting effect could be prevented by chlorpromazine, reserpine and azacyclonol whose effects are in contrast to those produced by barbiturates. TOMAN *et al.* describe the possible use of the

study of seizure latency in patients undergoing electro-shock therapy as a technique for investigating psychotrophic drugs. The effect of meprobamate on the electrical activity of the thalamus and other sub-cortical areas is described by HENDLEY, LYNES and BERGER. HIMWICH and RINALDI have an interesting contribution on the effect of benztrophine methanesulphonate, which has characteristics of both atropine and diphenhydramine. This drug was found to be effective in small doses in correcting the overactivity of the reticular formation and this they consider may account for it's therapeutic motor-effect in patients with parkinsonism. They consider that overactivity of the reticular formation can be produced by reserpine and chlorpromazine and that this may be a possible explanation for the parkinsonism which sometimes accompanies the use of these drugs. Some metabolic aspects are described by GRENELL, particularly the level of adenosine triphosphate, which he claims is directly related to the effect of chlorpromazine. An interesting report on the effect of adrenolutin on mental and physiological functions in human beings is given by HOFFER.

The part of the book dealing with the therapeutic effects of these drugs is not of such a high standard as that dealing with physiological and biochemical aspects. Some of the reports have not utilized double blind and other control procedures, which are indispensible for therapeutic trials of new drugs in psychiatry. The book as a whole is a valuable contribution to the rapidly developing field of psychopharmacology and can be recommended to all interested in this field.

LINFORD REES

D. W. WINNICOTT: **The Child and the Outside World.** Tavistock Publications, London, 1957. 190 pp., 16s.

THIS book contains a series of papers written by the author during the past 18 years on child care and development and is addressed primarily to teachers and case workers.

Included in the volume are a number of war-time broadcasts on problems related to massive evacuation of children from danger areas to safer parts of the country. Although these deal with war-time conditions, the lessons learnt from them can be fruitfully applied to the care and understanding of children at the present time. The book is clearly written and avoids excessive use of medical and psychological jargon. It can be recommended as an introduction to anybody professionally concerned with the care of children.

LINFORD REES

Discussions on Child Development. Vol. III. Edited by J. M. TANNER and B. INHELDER The proceedings of the third meeting of the W.H.O. Study Group on the psychobiological development of the child, Geneva, 1955. Tavistock Publications, London, 1958. 223 pp., 28s.

A small group of eminent representatives from different scientific disciplines, interested from their several points of view in child development, have held a series of meetings to discuss presentations on various aspects of the subject. The third meeting focused upon the development of sex differences, and the development of individuality or ego identity and the patterns of psychological development, which leads up to it. The main presentations to this meeting were made by a cultural anthropologist and by a psycho-analyst; these points of view dominated the discussions.

The group met to increase their mutual understanding; it was not intended to make decisions or recommendations on any subject. This verbatim record of the presentations and subsequent discussions, inevitably shortened by the editors, is of some interest, particularly to child psychiatrists. Some of the discussion reported, however, is trivial and irrelevant; it is also irritating when speakers refer back to unreported remarks. Purposefully no attempt has been made to draw the threads of discussion together or to reach conclusions, so that the reader is left to gather up the scattered information.

It is obvious that informal debate by scientists from several disciplines on some subject of mutual concern may be most valuable to the participants. However, it is questionable how far its value can be conveyed to those outside the group by written report.

W. WARREN

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LORD COHEN OF BIRKENHEAD: **Sherrington—Physiologist, Philosopher and Poet. The Fourth Sherrington Lecture.** Liverpool University Press, 1958. xiv + 108 pp. Price not quoted.

THIS is a fascinating and erudite study of SHERRINGTON written with all the clarity and charm which one associates with LORD COHEN. Beginning with an exposition of SHERRINGTON's physiological work, the account passes to SHERRINGTON as a poet and philosopher, and ends with a complete bibliography of his writings—altogether 317 items, which alone will be of great value to the medical historian. SHERRINGTON was Professor of Physiology in Liverpool, January 1895–1913, and here he carried out the researches which were embodied in his only book on the physiology of the nervous system—his famous *Integrative Action of the Nervous System*, published in 1906. From Liverpool he moved to Oxford, to remain Professor there until his retirement at the age of 78. His book on JEAN FERNEL was written at the age of 89, and in his ninty-fourth year he revised and corrected his book *Man on his Nature*, which had first appeared in 1940. It seems that the great men in the field of brain and mind, SHERRINGTON, PAVLOV, FREUD, and JUNG, live to a ripe and vigorous old age.

SHERRINGTON's philosophical views were not as revolutionary as his physiology, for he was an exponent of a Cartesian dualism, and to quote LORD COHEN "in this field SHERRINGTON's thinking cap was second hand—it had indeed been worn by all the exponents of dualism for three centuries since the days of Rene Descartes." Poetry was an enthusiasm of SHERRINGTON's and even at the age of 73 he could recite by heart long passages from a new poem by ROBERT BRIDGES. His own poetry seems somewhat too verbose and devious, but SHERRINGTON's love of literature and of words finds expression in his verses.

So much has been written of FREUD, and such has been the publicity evoked by psychoanalysis that the other three great men have been somewhat neglected in comparison. LORD COHEN's felicitous lecture is a start in the right direction. It can be thoroughly recommended.

DENIS LEIGH

Neurotic Interaction in Marriage. Edited by V. W. EISENSTEIN. Tavistock Publications Ltd., London, 1957. xv + 352 pp., 30s.

IN this volume a number of experts, such as psychiatrists, psychologists and social workers discuss the basic components of neurotic interaction in marriage and give their various contributions to the understanding and solution of marital maladjustment. In most chapters the problem is seen from the standpoint of psychoanalysis. This is particularly true about the accounts dealing with individual treatment by a psychiatrist but also about those dealing with case-work and group psychotherapy. It is emphasized that the essential for a psychoanalytic therapist is to reveal the hidden sources of marital tension through demonstrating to the clients their unconscious emotional needs or compulsions to repeat forgotten infantile situations in the current relationship. The methodology does not therefore differ from what is described elsewhere in the psychoanalytic literature, but the cases become more complicated through the matter of neurotic choice of mate with consequent reciprocal neurotic patterns. Both partners in a marriage may therefore require treatment. In those cases of marital maladjustment where the disturbances are not too severe, it is claimed that good results occur with case-work. This therapy seeks to confirm a personal and family diagnosis on the basis of psychoanalytic concepts. The goal is not character change or treatment of pathological processes but a trial to improve or restore balance within the family and to alter social relationship and the surface behaviour. The same is valid for group counselling.

In the chapters about case-work the authors give rather detailed descriptions of what happens at various phases of treatment, and one would have liked to get something similar in the accounts of the psychoanalytic approaches to the martial problem. The examples which are given seem to be somewhat too summary.

The most interesting part of this volume is the comparison between marital partners as to the M-factor/human movement/in the Rorschach record. Though it is true that one has little possibility of exactly predicting marital adjustment with such methods, they will certainly help us to understand some of the problems involved.

The book is a good illustration of analytic thinking and of the methodology of social case-work. It will be of great value to all those who have to deal with disturbances in human relations.

ANNA STINA ANDERSON

F. H. SMIRK: **High Arterial Pressure.** Blackwell, Oxford, 1957. xxxvi + 764 pp., 75s.

THIS monumental book should be on the reference shelves of all readers of this journal. Professor SMIRK's own contributions to the subject are well known, and enable him to give a rounded and moderate account of the whole subject. Thus for instance the chapter on the psychosomatic aspects of high blood pressure presents a very excellent survey of the field, and it is refreshing to see a bibliography which is not exclusively American, but draws from British, American, German, Dutch, French and Scandinavian sources. Cultural factors, heredity, changes in living conditions are all carefully considered, as well as the physiological and pathological aspects, and the book is an excellent example of the comprehensive approach to medicine. In fact Professor SMIRK's views of the pathogenesis of hypertension could apply equally well in principle to the pathogenesis of conditions such as bronchial asthma, the elevation of the blood pressure depending, at some stages, on the total effect produced by the combined action of several components acting on an organism endowed with a certain heredity, and living in particular circumstances: "The stimuli which elevate the supplemental blood pressure in essential hypertension seem to be the same as those which operate in normotension"; all these kind of concepts are familiar to readers of this journal, and it is refreshing to see them so clearly recognized by a physician of Professor SMIRK's eminence.

The book is very well produced, and is by no means expensive.

DENIS LEIGH

DORIS ODLUM: **Journey through Adolescence.** Delisle, London, 1958. 186 pp., 10s. 6d.

DR. DORIS ODLUM has written for parents and others who deal with adolescents and their everyday problems. She has drawn on her considerable psychiatric experience in this field and with her forthright and lucid style, gives much sound and up-to-date advice. Her lively and readable book is in happy contrast to much written for the lay person on adolescence.

The emotional and social aspects of the age period are adequately covered; physical development is only briefly described. Abnormal states of mind are not discussed, although some danger signals indicating a need for medical or psychiatric help are wisely pointed out. It is clear that DR. ODLUM's sympathies are with the young and parents are castigated for their mis-handling. It is hoped, however, that they will not get too discouraged in their handling of their adolescent sons and daughters, who at least have to learn to cope with adult failings.

This book can be recommended. It is unfortunate that those parents who are so faulty in their attitudes and whose adolescent children are in difficulties severe enough to need psychiatric help, are so seldom amenable to good advice.

W. WARREN

K. M. BYKOV: **The Cerebral Cortex and the Internal Organs.** Translated and edited W. HORSLEY GANTT, Chemical Publishing Co., New York, 1957. 409 pp., $15.00.

THIS book by BYKOV, translated by GANTT, contains the summary of many years of investigation in the author's laboratory and the work of others in Russia, and his epitome of a point of view about the nature of disease. The report is significant, not only because the work described has affected medical practice throughout the sphere of Soviet influence, but because the attitude towards disease is in many ways different from that of other nations.

The assets of the book rest chiefly in the type of question that is asked. For example, an attempt was made to find out what the oxygen utilization of a factory worker would be on a work day compared to that on the one non-work day in the week. The authors found that the oxygen utilization of the subject on a work day (while in a resting state) was from 15 to 30 per cent higher than on the non-work day at the same time of day, in the same room and under ostensibly the same circumstances. The latter differed only in that on one day the subject came from the shop and on the other from his

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home. The author suggests that this represents a rise in the cellular metabolism of the body on the work day. However, it is more likely in the reviewer's opinion, that the increase in oxygen utilization is made necessary by unwitting contraction of skeletal muscle on the work day. Regardless of interpretation the facts remain and support the view that the setting, time and attitude of the subject may determine the bodily economy.

Another important contribution made by BYKOV and his students has to do with the question of whether neural pathways, or hormonal agents are mainly involved in a conditioned reaction. The investigator eliminated one or the other and demonstrated that the capacity to exhibit a conditioned reaction was still present. But when, for example, in the case of a conditioned diuresis, both are eliminated as by sympathectomy of the kidney and ligation of the infundibulum then the conditioned reaction is completely abolished. One may be in doubt about the technical aspects of the evidence presented but there can be no doubt about the importance of the question. Moreover, the accumulated evidence of the author makes it seem likely that either the long neural pathways or endocrine agents via the hypothalamus or both may operate in conditioning.

As the title implies, BYKOV speaks of the cerebral cortex as it relates to the internal organs as though this were the only issue involved in conditioning. In the first place, the inference is made from the start that the cerebral cortex is the anatomic structure responsible for the reactions described. Whereas this is for the most part justified, it should be clear that the cortex, *per se*, has been but rarely specifically examined by the author. He has actually studied high level integrative functions, and not a particular part of the brain. Secondly, little mention is made of the nature or the origin of the needs, drives and motivations of the individual in whom he establishes conditioned reactions. The implication is that these too are aspects of the functions of the cerebral cortex. The possibility that the brain is merely an organ of means for bringing about the fulfillment of certain needs is not even raised. The bias of this reviewer makes it difficult for him to recognize in the cerebral cortex the locus of origin of many important needs, even though the functions of the cerebral cortex contain the means for their execution. As a result the monograph falls short of being fully satisfactory.

Unfortunately, the book lacks reference to significant work done in the United States and other countries outside of Russia during the last 10 or more years and therefore is an inadequate statement of the many investigations and concepts developing in the west. The writing is not always clear, although the format of the book is pleasant and the illustrations are adequate. Despite its shortcomings, this monograph colourfully summarizes a dynamic attitude toward medicine and emphasizes the importance of the setting of the individual to an understanding of the initiation of his diseases and their perpetuation.

H. G. WOLFF

W. PENFIELD: **The Excitable Cortex in Conscious Man.** Liverpool University Press, 1958. 43 pp., 10s. 6d.

THIS little monograph records the fifth Sherrington Lecture of the University of Liverpool. In it Professor WILDER PENFIELD summarizes his experiences gained through stimulation of the brain by means of an electrode during the course of operations on epileptic patients. He and his various associates have written extensively on this subject, and this monograph may be regarded as a condensation of several previous papers and books. The principal cortical areas that yield positive responses to gentle electrical stimulation are listed under three groups—sensory, motor, and interpretative. Particular emphasis is placed in this monograph upon the interpretive illusions and experimental hallucinations that sometimes follow stimulation of the temporal cortex in epileptic subjects. In evaluating their significance it must be remembered that such responses are rare and appear to be limited to epileptic subjects. The author considers that the positive effects of stimulation are due to dromic cortico-fugal conduction to distant but functional nerve cell groups located either in the brain stem or in the hippocampus. The monograph can be recommended to those readers who desire an introduction to this subject.

M. A. FALCONER

T. G. CONNOLLY and W. SLUCKIN: **Statistics for the Social Sciences.** Cleaver-Hume Press, London, 1957. Second Enlarged Edition. 166 pp., 16s.

STATISTICAL science has two fundamental objectives. They deal, respectively, with the collection of quantifiable data and with the analysis of these data. The first objective aims at ensuring that data collected by means of survey or experiment are as free as possible from distortion through biased or arbitrary selection procedures. The second objective seeks to ascertain whether the data at one's disposal deviate significantly from the attributes which characterize data that have come together by mere chance.

The two objectives are complementary and should not be treated in isolation. Unfortunately, introductory texts on statistics generally ignore the first objective. They content themselves with the assumption that one's data have been obtained by legitimate means. As a result the misleading custom has grown up of identifying statistical science with the special numerical techniques of analysing collections of data.

This book, which has been expressly written as an elementary text for students of psychology and social science, is no exception. It is a workmanlike exposition of the computational techniques employed in the statistical analysis of data. It deals with averages, the measures of variability, the testing of significance in large and small samples, the principles and methods of correlation, and the rudiments of the analysis of variance.

The mathematical exposition is easy to follow by anybody with a smattering of algebra. The text proceeds by slow steps and with detailed illustrations from simple to more complex topics. The book thus succeeds well in its limited aim to convey the elements of statistical analysis.

F. KRÄUPL TAYLOR

Ciba Foundation Symposium on the Neurological Basis of Behaviour. Edited by G. E. W. WOLSTENHOLME and C. M. O'CONNOR. Churchill, London, 1958. 52s. 6d.

REPORTS of small international meetings on this topic now appear regularly at least once a year. The pace of research ensures that their content differs but the general scope of the work and the actual participants are less varied. The clinicians tend to be elderly and eminent, the laboratory workers younger and inevitably preoccupied with their own line. Almost any aspect of brain function might be related to behaviour, so the symposium ranges from microelectrode studies of individual nerve cells to problems of human memory. The discussions that took place at the end of each paper are often more revealing of the way people are thinking than the actual data reported, but at times the arguments revolved around technical minutiae. Amongst newer trends and methods of investigation may be mentioned the neurophysiological studies of OLDS on Drives; the influence of hormones on the central nervous system especially the midbrain reticular core as described by DELL; and the studies of Pavlovian conditioning by electrophysiological techniques (GASTAUT, JASPER). In due course such methods must throw light on the acquisition of patterns of behaviour both normal and "diseased", and that interaction of the brain with other bodily functions which seems so important in psychosomatic disease. There is however still a long way to go—it is doubtful if a single laboratory investigation reported here or in any other similar recent symposium has yet altered any currently used diagnostic and therapeutic measures in psychiatry (perhaps this just shows what a backward subject this still is). However two matters of great importance for current clinical practice were hardly noticed in this symposium. The first was the important factor of individual differences within the same species (it was mentioned in RICHTER's paper on the permanent effects of severe stress in rats). There was also no discussion of effect of growth and maturation of organisms as opposed to the short term learning experiments performed on animals that are assumed not to change in function during the experimental period except as a result of the experiments themselves. Even as it is, however, the report contains more than enough of interest to all readers of this Journal who want to keep up to date with recent advances in the relation of brain function to the behaviour of the whole organism.

D. A. POND

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S. COBB: **Foundations of Neuropsychiatry.** Sixth revised and enlarged Edition. Baillière, Tindall & Cox, London, 1958. ix + 313 pp., 40s.

THE continuing success of this book is a tribute to the wisdom and knowledge of STANLEY COBB. Only a person with the encyclopaedic knowledge, pristine enthusiasm and lifelong experience of this well loved physician could have written such a book. Re-reading it in this latest edition, one is struck anew by the masterly incorporation of all that is best of the recent advances in anatomy and physiology into a terse and well ordered framework of information on which is built our knowledge of neurology and, to a lesser extent, of psychiatry. Although the book is "written to give practitioners and students of medicine the facts and correlations needed to understand the simpler workings of the central nervous system" in fact one would be happy to know that many fully trained psychiatrists had as much knowledge as is available here. Psychiatry suffers still from the prolixity of its practitioners, from their fascination with words and philosophy, rather than with the facts of the nervous system. Here again is a robust reminder from that grand New Englander that no psychiatrist can afford to neglect the nervous apparatus, particularly if he is entrusted with the teaching of students. Let us hope there will be many more editions to come.

DENIS LEIGH

A. B. HOLLINGSHEAD and F. C. REDLICH: **Social Class and Mental Illness; A Community Study.** Wiley, New York, and Chapman & Hall, London, 1958. 442 pp., 60s.

Is mental illness related to class in our society? Does a psychiatric patient's position in the status system affect how he is treated for his illness? These are the two central questions in this research, and to investigate them the authors studied all the patients from New Haven, Connecticut, who were under treatment by an accredited psychiatrist between 31 May and 1 December 1950. These patients were compared for socioeconomic status with a 5 per cent sample of the "normal" New Haven population. The thoroughness of their research is matched by the clarity with which the authors present their results in a most readable book.

The authors put forward evidence supporting the view that the true prevalence of schizophrenia is highest in the lowest socioeconomic group, that this is not due to "drift", but is the product of the life conditions of the lowest strata of society. With regard to the other psychoses and the neuroses, it must be emphasized that the investigators concerned themselves with patients actually undergoing treatment, and inferences about the true prevalence in the population are risky. Nevertheless the pronounced class differences in the prevalence of treated patients, the types of psychiatric illness and the treatments offered to these patients raise questions of importance not only to psychiatrists but to society generally.

C. M. B. PARE

E. B. STRAUSS: **Psychiatry in the Modern World.** Michael Joseph, London, 1958. 71 pp., 8s. 6d.

THIS book is written for the interested layman and has no pretensions to being a potted textbook. It could well have been subtitled "Everyman's psychiatric what's what" and introduces the reader to the various illnesses in psychiatric practice and to the people who deal with them. It does this clearly and concisely. Originally it was written as a series of newspaper articles, presumably for the casual reader, but it lacks the scope and detail which a person sufficiently interested to buy a book on the subject might be expected to demand.

C. M. B. PARE

A. E. MAXWELL: **Experimental Design in Psychology and the Medical Sciences.** Methuen, London, 1958. 147 pp., 17s. 6d.

STATISTICAL methods have acquired high prestige in research today. There are very few research workers who are foolhardy enough to disdain the use of some statistical device such as chi square, correlation or *t*-test, or dare draw conclusions from their findings which are not supported by tests of statistical significance. The differences or changes observed in an investigation or experiment may not be "real", but merely due to chance effects. To assess the "reality" of one's findings, one needs the help of statistical methods which demonstrate how likely or unlikely it is that one's findings have arisen by chance.

But the literature is full of papers in which the application of statistical methods led to wrong and misleading conclusions because the experiment was so badly designed that significant findings were missed. There are also many papers with statistically significant results which were, however, only obtained after "unreliable" data had been eliminated albeit in good faith, but in violation of statistical rules.

Statistics is a mathematical instrument which yields valid and reliable results only when it is supplied with properly collected and uncontaminated data. Most statistical textbooks limit themselves to explaining the nature of the mathematical instrument and to demonstrating its uses on data which are presumed to have been correctly assembled. But the efficacy of the instrument can be enhanced if data are obtained with the help of experiments that have been specifically designed and planned with the potentialities of the instrument in mind.

In 1935, Sir RONALD FISHER wrote the first textbook on the design of experiments from the statistical angle. It is not a book, however, that can be recommended to beginners. Dr. MAXWELL, who is lecturer in statistics in the Institute of Psychiatry, London, has had much opportunity to realize how hard it is to impart knowledge of this subject to psychologists and psychiatrists who often have a rooted aversion toward mathematical symbolism and thought. He has bravely attempted to write this textbook on experimental design for them so as to avoid the deterrent of too much mathematical explanation and yet to give an inkling of the ideas involved in the various designs. He has, in my opinion, been fairly successful in achieving his aim. He makes ample use of practical examples drawn from his experience with the problems his psychological and medical colleagues have submitted to him. In each case he describes suitable experimental designs and supplies full computational details so that the student is enabled to follow the procedures step by step.

The statistical evaluation of data is based on the fundamental question: What is the probability that these results have arisen by chance? The first requirement of a properly designed experiment is therefore to provide conditions in which the forces of chance can play their part unhampered. The second requirement is to plan the experiment so that unwanted but unavoidable influences do not selectively contaminate the data, but are distributed among them in a random or balanced manner. If, for example, a psychological test is applied before and after a particular treatment, the disturbing effects of suggestion, practice, fatigue and other less obvious influences have to be eliminated by suitably designing the experiment. The third requirement is to choose a design which makes allowance for certain inevitable shortcomings in the experiment. It may not always be possible to have a control group, or one that is comparable in all relevant aspects to the experimental group: it may not be feasible to administer all tests or treatments to every subject under investigation; certain treatment arrangements may be inadvisable. Possible designs for these and similar shortcomings are suggested in the book. A final chapter deals with the evaluation of the relative efficiency of different experimental designs in particular problems.

The book does not make easy reading. In fact, it requires concentration and attentive study. It also presupposes a smattering of basic statistical concepts, although the author attempts to supply this in a condensed first chapter. There are some disturbing misprints which may confuse the unwary student. But a great deal of material has been successfully squeezed into this slim volume. It is certain to repay careful study.

F. KRÄUPL TAYLOR

E. LOMHOLT: **Home Conditions. A Study of 1066 Hospitalized Patients with Skin and Venereal Diseases.** Rosenkilde and Bagger, Copenhagen, 1958. 100 pp. No price quoted.

THIS monograph labours under the difficulty that it was planned first "to demonstrate aetiological

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factors of a sociomedical nature in certain groups of diseases". As little worthwhile came out from the data, the same material was used to provide "detailed systematic information on the family conditions and entire environments during childhood of a certain group of patients" in the Danish provincial town of Aarhus. A major defect is that no proper control groups were obtained for the bulk of the results, and recourse to other recent or contemporary social investigations had to be made.

The study nevertheless contains some interesting information. The material consists of 1066 patients (819 adults, 247 children) admitted for the first time during 1950–1953 to a skin and venereal diseases hospital. In addition to the 1066 patients, 381 parents of the hospitalized children were interviewed. The series of adult patients was divided into a larger group with skin diseases (698 individuals) and a smaller group with venereal diseases (121 subjects). The series was contrasted with the general population of Aarhus (for which recent census figures were available) and found comparable with regard to age, marital status, occupational conditions and membership of the health-insurance societies.

The author was able to answer such questions as: "Do patients who are admitted to a hospital department represent an ordinary cross-section of the community, viz. those who fall ill and need treatment, or do they, on essential points, differ from the population in general with regard to growth conditions, social status, family affairs, education and housing during childhood".

He found that patients admitted to the particular hospital represented an ordinary cross-section of the community. More specifically the relation to "broken homes" was considered. Surprisingly it was found that 40 per cent of both the patients and the parents of the hospitalized children came from broken homes. It was "assumed" that this reflected the state of affairs prevailing in the general population. It was also noted that irrespective of broken or unbroken homes, there is a definite relation between emotional traumata and nervous complaints of all types. The only data quoted from the original investigation is that children with Besnier's prurigo (atopic dermatitis) come principally from unbroken homes and women with leg ulcers hail chiefly from poor homes.

Of some interest is the finding that the incidence of behaviour disorders (enuresis, nail-biting and pavor nocturnus) was identical (60–70 per cent) in both the hospitalized children and in a normal control series of school children. The high incidence of behaviour disorders in so-called normal children may come as a surprise to many readers.

The monograph is agreeably produced and well tabulated. For a subject so large, there are strikingly few references.

E. MARLEY

E. STENGEL and NANCY G. COOK: **Attempted Suicide—Its Social Significance and Effects.** Maudsley Monographs No. 4. Published for the Institute of Psychiatry by Chapman & Hall, London, 1958. 136 pp., 25s.

STUDIES of attempted suicide have tended to adhere to a rather stereotyped recital of psychiatric diagnoses and alleged causes of the attempt in a series of cases. This book introduces a refreshing change of approach, new notions regarding attempted suicide and some brand new facts. The aims of Professor STENGEL's research were to examine his contention that there are problems peculiar to attempted suicide by which this act may be distinguished from suicide, and in particular, he undertook to study the social circumstances and effects of the suicide attempt and to compare these with suicide.

The method is clinical and descriptive, statistics being deliberately shunned although most of the important data are, in fact, tabulated. Among the many admirable features of the design of this enquiry were: first, that a number of samples of attempted suicide were examined, so that the authors amassed a composite group of attempted suicide which might reasonably be expected to reflect more truthfully the characteristics of the attempted suicide population. Secondly, that each sample was chosen and studied so as to elucidate a particular aspect of the problem. The first two samples, therefore, were follow-ups of suicide attempts which had been admitted some years previously to an observation ward and to the Bethlem Royal and Maudsley Hospitals: these samples were well suited to investigate the social consequences of the original attempt, the incidence of subsequent suicide or suicide attempt, and of illness. The third and fourth samples were patients admitted to two observation wards serving two different populations. They enabled the social circumstances and behaviour

of the patient at the time of the attempt to be studied, and also the degree of danger and intent among attempted suicides. The fifth sample was of admissions to a general hospital, and these suicide attempts were compared with those sent to the observation wards. The third and most significant feature of their design was that many of these characteristics of attempted suicide were compared with a sample of suicides.

Detailed interviews were obtained with the relatives and patients composing the first two samples. The authors found that the suicide attempt resulted in a very definite and often salutary change in the patient's relationships with others. These observations led STENGEL to formulate the interesting notion that the suicide attempt is in the nature of an appeal to the human environment and that this is one of the primary functions of the suicidal attempt. Considerable evidence is adduced for this view, among which was the valuable finding that remarkably few suicide attempts are followed by fatal suicidal acts, although subsequent *attempts* were not uncommon.

The authors' analysis of the site of the suicidal act in relation to the social field, the extent to which the would-be suicide was alone or moving towards others at the time of the attempt, and of the agent intervening, is of great interest. Similarly, there is a valuable assessment of intent and dangerousness in the different samples and diagnostic groups.

The comparisons made between suicides and attempted suicides are particularly important. Figures for age, sex, marital status, social class, isolation, methods, site of the suicidal act, movement and degree of isolation during it and diagnosis are given for both groups but no analysis of these findings is made.

I do not agree with the authors' very diffident attitude towards these figures. The consequence of their positive aversion to their statistics has been that their data are presented less effectively than they deserve, and that their findings are deprived of their full value. For example, they stress that because their samples are not representative no general conclusion should be drawn from their figures, although it seems to me that it is justifiable to do so. If the age distributions of four of their samples are compared—see Table 30 and omitting the Maudsley group as it is selected for age—it is found that the differences between them are not significant; but there is a highly significant difference between the ages of these samples and those of the suicides. It is likely, therefore: (a) that their samples truly represent that population of attempted suicides which are viewed sufficiently seriously by the community to warrant taking some positive action—to establish this is most relevant to their whole text; (b) the differences between the suicides and attempted suicides in age distribution is concrete evidence for one of the crucial problems they are examining (that the two suicide populations are distinct). Similarly, the differences in the sex distribution, the degrees of being alone, and of categories of mental disorder as well as the incidence of psychoses, reactive depression and psychopathy in the suicide and attempted suicide groups were, on my calculations, all significantly different, even when those samples are included in which the selection is known to be acting contrary to the hypothesis that the two populations are different.

It is, perhaps, inapposite to make these points when the authors affirm that a statistical analysis of the samples was not one of their purposes, but the thirty-three very interesting tables they publish invite exploration.

I believe this is an outstanding and stimulating contribution to the subject of suicide which will certainly be very widely read and commented upon.

P. SAINSBURY

J. B. RHINE and J. G. PRATT: **Parapsychology: Frontier Science of the Mind.** Blackwell, Oxford, 1957. ix + 220 pp., 37s.6d.

THIS latest survey of experimental work on extra-sensory perception deserves careful consideration as coming straight from the horses' mouth. The authors are respectively Director and Assistant Director of the Parapsychology Laboratory at Duke University, N. Carolina. The book sets out to explain the methods of card guessing and dice throwing that have now been in regular use for years by those concerned with psi effects. It is not so much a survey of the evidence as a text book of methods, a sort of do-it-yourself instruction book. Readers accustomed to designing psychological experiments will find it elementary in the extreme, but at the end of each chapter there are useful lists of references to original reports.

The tone of the book is more sober and the claims more modest than in some of Dr. RHINE's previous writings for laymen. For instance, the variability of results according to the personality of the experimenter, and the fact that some would-be experimenters might just as well give up trying to get positive results, are at last freely admitted. By implication, if not by direct statement, some of the difficulties that beset ESP investigators become apparent, in particular the non-repeatability, the transience, the unpredictability and the marginal statistical significance of many of the results obtained. In spite of this, much worthwile evidence has accumulated, and the subject deserves more active attention from experimental psychologists.

Little advance has been made in understanding the nature of ESP, and this shows up very clearly in the experimental exercises the authors describe. These have not changed since the card-guessing type of experiment got under way 30 years ago. The same questions are still being asked. Can the subject guess the card when no one looks at it? Can he guess an "imagined" card that has no material existence? Can he predict a card not yet selected? Until someone thinks up some fresh ideas and devises techniques that give more reliable results research in this field is liable to stagnate. The subject could do with a few fresh minds. Perhaps the most hopeful sign is the list of awards and scholarships now available to experimenters who are willing to tackle these difficult problems.

D. J. WEST

A. GARMA: **Peptic Ulcer and Psychoanalysis.** Baillière, Tindall & Cox, London, 1958. P. viii + 143 pp., 48s.

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DR. GARMA's book has appeared in Spanish, next in French and this is the English version. His views are by now well known, having been propounded in 1944, and emphasized and re-emphasized since then. They owe a great deal to MELANIE KLEIN, and can be summarized as follows. The person predisposed to the development of peptic ulcer will develop ulcer symptoms when in conflict situations which reactivate "the unconscious psychic image of the bad internalized mother". This introjected object acts aggressively on the individual in oral-digestive regression—sensations of being bitten internally follow upon the remorse felt by the patient. A train of events is set going which ultimately leads to the development of an ulcer.

The book is a mine of information on the psychopathology of Dr. GARMA's peptic ulcer patients—full of intriguing suggestions, and the most profound psychoanalytic study of the subject extant.

DENIS LEIGH

W. HØJER-PEDERSON: **On the Significance of Psychic Factors in the Development of Peptic Ulcer.** Ejnar Munksgaard, Copenhagen, 1950. 232 pp., no price quoted.

IT is frequently lamented that much laborious observation in the field of psychosomatic enquiry is of very doubtful value owing to the lack of controls. This defect is the more marked the further the method of enquiry purports to go beyond the surface of the personality. Psychoanalysts are usually the worst offenders. Dr. W. HØJER-PEDERSON has here made a substantial contribution to the study of the personality of sufferers from peptic ulcer, using an approach similar to that of ALEXANDER but with the inclusion of a control series.

His monograph consists first of a reveiw of the relevant literature, that might with advantage have been more closely critical; then a description of his systematic investigation and its results; and finally a discursive comment on the more prominent conflicts found in ulcer patients during intensive analytic study especially as they relate to the findings from his systematic enquiry; from all of which he formulates a tentative general theory of psychosomatic illness. The investigation consisted essentially of the study of fifty-one men with duodenal ulcer by means of clinical interviews and a self-selection personality inventory constructed by the author. The search for a control series is described

with heart-rending candour, and recourse had finally to be made to the sixth choice in order of preference, viz. volunteers from the administrative and maintenance staff of the hospital, matched for sex and age. The results were many and varied and in general were consistent with Alexander's theories. The items compared ranged from simple sociological descriptions, e.g. the economic status of the home, through inference from the clinical interview material, e.g. the intensity, extent and duration, of the attachment to the mother, to *a priori* concepts from the personality inventory.

The shortcomings of the control series are obvious, but this is only a particular example of a general difficulty in any such investigation. Furthermore, the shortcomings are stated plainly so that the reader can bear in mind the reservations that must be held while conning the results. The question of the reliability of the methods used is left wide open. This must also temper the reader's credulity, but should not obscure the value of a conscientious enquiry made upon sizeable numbers. Emphasis was placed in the interview not only on the anamnesis but also on inferences from the actual dynamic transactions at the time, and these are notoriously difficult to check for reliability, though none-the-less important.

The personality inventory is not a well-known one. Its construction seems rather arbitrary and there are as yet no general descriptions of its characteristics in action or the meaning of its findings. Doubt about such meanings can hinder the drawing of intelligible conclusions even though differences between the two series have been convincingly demonstrated. For example, even the term neurotic as used by the author (a term used to describe 40 per cent of the controls) does not appear to mean quite the same thing as the term when used in England (which is found to be relevant to no more than about 25 per cent of working men). In fact, with the nebulous terms that psychiatry has to put up with at the present time if it is to tackle what appear to be fruitful fields of enquiry, a fairly wide discussion with frequent references to other work is required to make the terminology intelligible. The author has served us well in this matter and in view of the importance of his work readers who must rely on English cannot help but complain of the poor translation.

R. H. Gosling

H. Faure: **Cure de Sommeil Collective et Psychotherapie de Groupe.** Masson, Paris, 1958. 272 pp., 2500 Fr. fr.

"Sleep treatment" has for many years been one of the chief psychiatric therapies in Soviet Russia, and its use has persisted much longer in Europe than in England or America. The discovery of chlorpromazine marked a new era for the adherents of this treatment, for now sleep could be more easily and safely obtained by using a combination of chlorpromazine and barbiturate. If it be admitted that prolonged "sleep"—albeit a drug induced "sleep", is therapeutic, then this is an important advance. In this book Faure presents a novel method of treatment combining both sleep and group therapy. In 1954, with Henry Ey, Faure began to organize a unit in which every month, six or seven women patients begin a course of sleep therapy lasting about 3 weeks. The sleep unit resembles a sort of "artifical paradise", thickly carpeted, blue lighted, and with the words on the door "here you sleep". Noise is cut down to a minimum. In the dayroom everything is different, bright colours, a distant, ever present sound, comfortable furniture. The whole unit is wired for sound, so that in the doctor's office ("the command post") everything that goes on in the unit can be heard, or transmissions made of orders, sounds or music.

The patients are given drugs three times daily—sleep and wake three times daily, and participate twice daily in group therapy, which centres around the meal table. Individual psychotherapy may also be given twice or once daily, or every 2 days. Particular attention is paid to dream material and Faure devotes a large part of his book to the use of dreams in this therapy.

This is a brief sketch of the organization of the unit. The major part of the book is devoted to the psychotherapeutic aspects of the method and makes interesting reading. The writing is lucid and the language devoid of the complication found in so many communications on psychotherapy. The book is of particular interest to those concerned with the problems of brief psychotherapy, and the hospital treatment of the neurotic patient. It can be thoroughly recommended.

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Journal of Psychosomatic Research, 1959, Vol. 4, pp. 65 to 87. Pergamon Press Ltd. Printed in Northern Ireland

INVESTIGATION OF PSYCHOPHYSIOLOGIC RELATIONSHIPS WITH SKIN RESISTANCE MEASURES*

A. J. SILVERMAN, M.D., S. I. COHEN, M.D. and B. M. SHMAVONIAN, Ph.D.†

THE interrelationship between emotional and physiologic factors is so well known that it need not be belaboured. In general, two types of relationships have been described: (a) a nonspecific relationship in which psychologic stimuli or emotional reactions act as general alerting phenomena and call forth or are associated with physiologic responses, and (b) the association of specific psychologic factors with specific physiologic and biochemical changes.

Although both relationships have certainly been focused on by many research-oriented psychosomaticists, research in psychosomatic medicine has frequently been hindered, not so much by any lack of conceptualization, as by the lack of tools and techniques to integrate dynamic principles and biophysical changes.

The work to be reported in this presentation will attempt to describe what the writers consider an improved technique, which has thus far proved particularly valuable in exploring some of the nonspecific psychophysiologic relationships alluded to above.

It is clear that a rapid, objective technique to evaluate subtle changes in the intensity of affective response to stressful stimuli, a technique that would be sensitive to minor fluctuations in the human 'alertness level', would be of extreme value in research psychiatry. The use of the skin resistance as a sensitive indicator of reactivtiy to all kinds of stimuli has been known since the work of FÉRÉ and TARCHANOFF in the late nineteenth century. Rapid changes in skin resistance occur in response to external and internal stimuli. These galvanic skin responses appear to be dependent on the sympathetic nervous system as the final common path and probably represent pre-secretory sweat gland changes rather than the actual amount of sweating in an area. Indeed, recent work has suggested that these shifts in skin resistance represent permeability changes in a labile membrane (EDELBERG *et al.*, 1957). Although the vast literature that has accumulated in the past 60 years attests to the convenience of the GSR as an indicator of autonomic activity, it also contains controversial statements which have tended to discredit the instrument as a reliable psychophysiologic tool (LANDIS, 1932; MCLEARY, 1950). Major drawbacks in the use of the GSR as a discriminating instrument in psychophysiologic research, many of which have been recognized for many years, have been deficient instrumentation, a variety of techniques and the number of variables which had to be controlled (DARROW, 1927; RICHTER, 1929).

* The investigations reported in this presentation are supported in part by Aero Medical Laboratory, Wright-Patterson Air Force Base, Ohio Contract # AF 18(600)-1750, Air Force Office of Scientific Research Contract # AF 49(638)-354, Duke University Center for the Study of Aging USPHS Grant # M-2109 and H-3582, and NIMH Grant # M-2061. This support is gratefully acknowledged.

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Recent observers have also identified some of the many variables which must be controlled in GSR recording. MAULSBY and EDELBERG (1959) demonstrated that basal resistance varies inversely, though not linearly, with temperature. A similar relationship is shown to exist with areas of the electrodes (ROTHMAN, 1954; EDELBERG and BURCH, 1959). EDELBERG *et al.* (1957) have suggested that the electrical changes of the GSR represent permeability changes in a labile membrane. Because this membrane is readily accessible to solutions applied to the skin, the chemical make-up of the electrode medium becomes important. KCL depresses the GSR by about 50 per cent while other electrolytes, such as $CaCl_2$ and $ZnSO_4$, potentiate it, usually by about 200–400 per cent, and $AlCl_3$ by as much as 3000 per cent. These authors suggest that an irreversible electrode, like a lead plate, in spite of its polarizing ability, does not significantly affect the GSR amplitude.

INSTRUMENTATION AND METHODOLOGY

Using a newly designed, highly stable and sensitive galvanic skin resistance meter, it has been possible to record and discriminate fluctuations of about 20 Ω in skin resistance while simultaneously recording grosser shifts in the basal skin resistance. With this improved and sensitive instrument it has been possible to discern background, spontaneous fluctuations or 'nonspecific' GSR responses of the above order of magnitude.

The instrument consists of a Wheatstone bridge with subject forming one arm. Essentially constant current (20 μA) is maintained through the subject by means of the bridge excitation voltage flowing through a high resistance. Constant current through the subject provides a voltage drop which is proportional to the resistance and allows the use of a flexible, easily calibrated nulling system.

An initial balance is obtained by manual adjustment of a calibrated resistor for bridge balance with the autobalance system at centre. The reading of this resistor provides the base or subject starting resistance. Small resistance fluctuations around the balance point cause voltage fluctuations which are amplified and indicated directly by the meter or recorder. These fluctuations are linear and may be read directly in ohms.

If the resistance changes exceed the limits of the indicator, whether they are due to rapid responses or slow drift, the indicator system is automatically restored to centre by the insertion of known increments of voltage in series with the bridge junction. Because of constant current through the subject resistance, these voltage increments represent definite resistance steps. The process introduces abrupt steps into the indications which are easily distinguished from normal subject responses.

The autobalance system allows very small resistance changes to be indicated during periods where the base resistance shifts more slowly over ranges up to plus or minus 50,000 Ω, the maximum automatic control range varying with the sensitivity selected. At maximum sensitivity, the automatic control range is plus or minus 1500 Ω. When the automatic range is exceeded, the calibrated resistor must be readjusted manually.

Subject resistance is obtained at any time by adding the autobalance step setting and the response deflection to the reading of the above resistor. If proper sensitivity is selected according to the subject and experimental conditions, the autobalance will normally accommodate the measurement range without manual resetting over extended periods of time.

In the model of the instrument available to the writers, six sensitivities are available; the most sensitive being 312 Ω and the least sensitive being 10,000 Ω for full scale deflexion of the indicator.

The electrode site (we use the plantar surface of the feet which leaves the hands free to perform various psychomotor tasks, etc.) is prepared by washing first with tap water and then with acetone. KY jelly, a poorly electrolytic substance, is applied as the electrode contact medium. Then, the electrode is applied. We use a thin lead plate (2 × 4 cm). After the entire preparations are carefully taped to each foot, the individual dons socks and shoes, thus minimizing movement artifact. This technique has been found to be adequate for short duration experiments and provides stable, reproducible results. However, experiments in which the subject is required to remain in the situation for several hours may necessitate more careful preparation to avoid drying.

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Initial experimentation by GREINER and BURCH (1955) utilizing drugs affecting the central nervous system and the newly designed, highly sensitive instrumentation revealed that when a subject was given sedatives in fractionated doses, the number of spontaneous fluctuations (nonspecifics) per unit time decreased as he became more sedated. The amplitude of response to a repeated standardized electric stimulus also decreased (specifics). At the same time, the basal resistance increased. When sleep was reached, no further spontaneous fluctuations were seen. On the other hand, if the subject was gradually alerted by repeated injections of a stimulant drug, the number of nonspecific, spontaneous oscillations progressively increased. The amplitude of responses (specifics) to the repeated specific electrical stimuli also

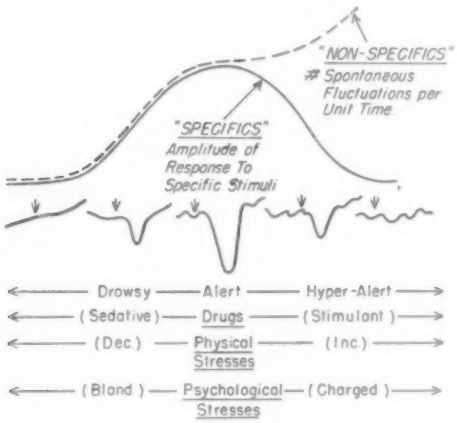
"NON-SPECIFICS"
Spontaneous Fluctuations per Unit Time
"SPECIFICS"
Amplitude of Response To Specific Stimuli
Drowsy — Alert — Hyper-Alert
(Sedative) — Drugs — (Stimulant)
(Dec.) — Physical Stresses — (Inc.)
(Bland) — Psychological Stresses — (Charged)

FIG. 1.—Galvanic skin reflex and the arousal curve. *Note*: As 'arousal' increases *nonspecific* GSR's increase while amplitude to specific stimuli increases and then decreases.

increased at first; however, as the injection of the stimulant drug continued and the individual was further activated, the specific and nonspecific responses were no longer parallel. The frequency of nonspecifics continued to increase while the specifics showed a progressive drop in amplitude. In these early experiments the number of spontaneous fluctuations in skin resistance were believed to reflect, in a roughly linear way, the level of activation of the central nervous system.

On the other hand, the response to the standardized external stimuli resembled a bell-shaped curve (see Fig. 1). The bell-shaped curve may, of course, represent any one of a number of parameters; perceptual acuity to specific external stimuli, apperception or the ability to initiate appropriate, organized goal-directed behaviour.

As the arousal state of the organism increases, a number of changes occur. From a state of inattention to external events associated with poor and sluggish motoric activity and decreased ability to react to external stimuli, the organism becomes a more alert, wakeful and vigilant individual, characterized by facilitated psychomotor performance focused attentiveness to significant meaningful stimuli and the ability to react more appropriately to stimuli with organized, goal-directed behaviour. However, as he becomes more aroused and more activated, he may become panicky,

unable to differentiate meaningful from nonmeaningful stimuli and unable to focus or constrict his attention on appropriate goal-directed tasks. His behaviour may become hyperactive and more disorganized. He is unable to perceive, integrate or to react to reality situations because of the intense, continuous, internal disruptive activity in the central nervous system (SCHLOSSBERG, 1954).

This frame of reference is, of course, closely related to the conceptualizations and experimental work which have begun to delineate the role of the brainstem reticular formation and arousal. Recent work by WANG *et al.* (1956) lends support to the notion of the relationship of reticular and GSR activity.

Since one difficulty in using the GSR has been its reactivity to innumerable stimuli (such as physical and emotional stimuli) which vary qualitatively and quantitatively, a frame of reference in which the GSR could be interpreted meaningfully in evaluating entirely different stimuli would be invaluable. The theoretic concept graphically illustrated (Fig. 1) shows promise as a possible solution to this problem. The amount of activation, or if one wishes, 'the degree of arousal', that any stimulus produces, may then be quantitatively compared with the results from other stimuli.

This report will attempt to explore the validity and reliability of the frame of reference, using basal resistance correlates as well as the parameters noted above, and the applicability of the frame of reference to a series of psychophysiologic investigations. This work represents a total of fourteen experiments on 120 subjects.

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BASAL SKIN RESISTANCE, LEVEL OF AROUSAL AND VASCULAR CORRELATES

A. *Basal resistance and nonspecifics*

The fact that, in general, basal skin resistance rises with relaxation and increases in sleep has been known for many years. Similarly, arousal of the organism and progressive excitement generally results in lowering of the basal resistance (CARRAN, 1959). More discrete responses (nonspecifics) are thus superimposed on a shifting baseline resistance. MALMO's recent work (1959) relating level of arousal to the shifting basal resistance appears to be a confirmation of the fact that basal skin resistance is inversely related to central nervous system arousal as expressed by amount of sympathetic 'tonus'.

Beyond the fact that changes in the level of alertness may produce a shift in the basal resistance, changes in the basal level of skin resistance have also been attributed to many other factors, e.g. (a) variations in blood volume in the areas where the resistance is being measured, (b) alterations in vascular tone, (c) variations in external and internal temperature, (d) pre-secretory sweat gland changes, (e) changes in the state of hydration and electrolytic concentration in the skin area and, (f) sympathetic discharges (DARROW, 1927, 1936; MCLEARY, 1950).

Our own work confirms, in general, the relationship of basal skin resistance with arousal. Preliminary work at our laboratory indicated that significant drops in basal resistance occurred with emotional stimuli, such as words or the application of pain as well as the injection of various stimulant drugs. Indeed, aside from the fact that transient increases in arousal may be seen as evidenced by increases in number of nonspecific fluctuations while the basal resistance in general does not

change, there is an extremely good correlation between number of nonspecifics and level of basal resistance. Thus, when the basal resistance is high and the organism is relaxed, in general, one may expect a lowered number of nonspecifics and a small increase in amplitude to a standardized stimulus. However, the response of the organism to a stimulus, even when the basal resistance is high, may result in a transient increase in arousal as seen by the numbers of nonspecifics while there is no material shift in the overall basal resistance. It would seem that this is essentially a matter of sensitivity of the recorder. For, in addition to the transient nature of

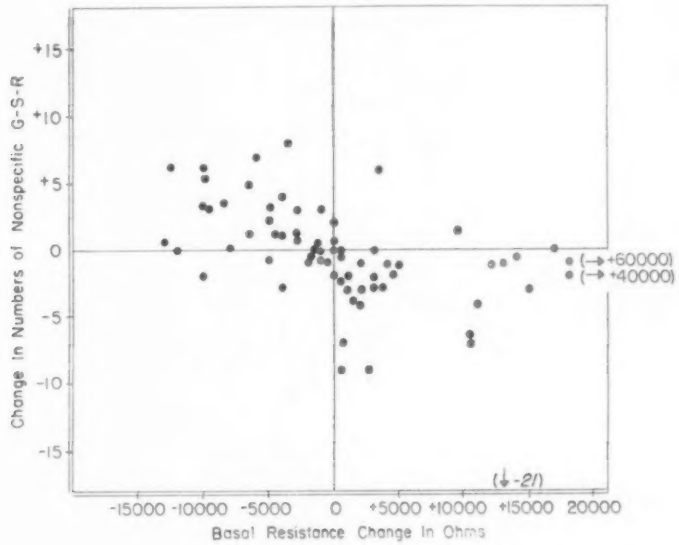


FIG. 2.—Inverse relationship between nonspecifics and basal resistance. *Note:* Demonstration of the fact that an upward shift in basal resistance is associated with a decrease in numbers of nonspecific fluctuation and vice versa.

the response, if the response were large enough it might get reflected as a shift downward of the basal resistance. An example of the high correlation between nonspecifics and basal resistance is given in Fig. 2, which relates changes in numbers of nonspecifics to changes in basal resistance and represents the seventy measures from our experiments where basal resistance data were available.

B. *Basal resistance and vascular changes*

Preliminary work with the human centrifuge at the Aeromedical Laboratory (Wright Patterson Air Force Base, Ohio) revealed the interesting observation that rather large decreases in basal resistance were noted on subjects exposed to positive acceleration.* In this condition blood tends to pool in the lower extremities due to the hydrostatic forces applied. Since the GSR electrodes were placed on the soles of the feet, it was considered possible that the basal resistance drops were due to the

* As the centrifugal force is increased in this condition, with the subject's head toward the fulcrum of rotation, the force tending to push the column of blood toward the periphery may be expressed in *g* (gravitational) units. Thus, a force of 3*g* represents three times gravity or three times the weight of the subject.

associated blood volume shifts. However, they might also have been due to sympathetic vasoconstrictive impulses resulting from sino-aortic reflexes activated by the "hypotension" in the upper part of the body. With these two possibilities in mind a series of projects was conducted to evaluate the meaning of basal resistance changes during acceleration stresses.

1. *Effect of* g-*suit protection.* In a series of ten 30 sec rides at 3*g*, with and without *g*-suit protection (the *g*-suit compresses the abdomen and lower limbs during acceleration), it was noted that at the end of the tenth run, subjects *without protection* showed

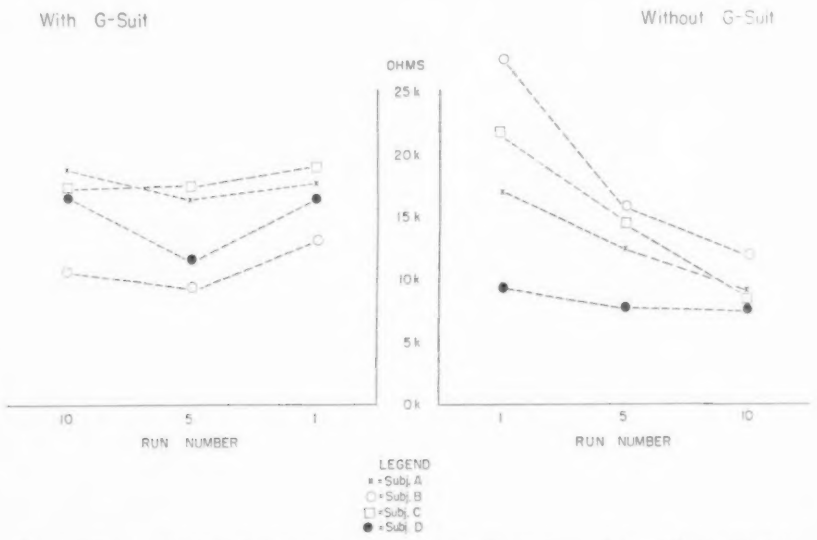


FIG. 3.—Basal resistance changes in ten successive 3*g* 30 sec runs. *Note:* When subject is protected by the *g*-suit (which decreases peripheral blood pooling) the basal resistance is maintained. When unprotected a gradual fall in basal resistance is noted.

a *decrease* in basal resistance while those *with protection did not*. Fig. 3 compares the basal resistance level at the first, fifth, and tenth rides of four subjects. This study reflected, but did not solve, the problems posed above. Thus, either the *g*-suit prevented progressive increase of blood volume in the extremities and, hence, obviated blood pooling, thus accounting for the difference in basal resistance *or* the protection afforded by the *g*-suit decreased the intensity of cardiovascular reflex activity needed to maintain blood flow to the upper part of the body (SILVERMAN *et al.*, 1957c).

The relationship of basal resistance to blood volume changes or cardiovascular reflex activity seems even clearer when one considers that the basal resistance level in subjects who were wearing the *g*-suit was maintained in spite of the arousing nature of the rides and the discomfort produced by the inflation of the *g*-suit, two factors, which by themselves, could decrease basal resistance.

2. *Basal resistance changes with rapid and gradual acceleration.* The amount of resistance drop which occurred when a subject was exposed to gradual onset acceleration of 1*g*/15 sec was considerably less than any change occurring with rapid acceleration, and a higher *g*-level was inevitably obtained than during rapid onset acceleration.

Further, some subjects showed even *less* basal resistance drop during gradual onset acceleration than they did on rapid onset when protected by the *g*-suit. These subjects attained a higher *g*-level during gradual onset than they did on rapid onset when protected by the suit. Here, it would seem, a greater amount of protection was derived when the body's compensatory mechanisms were fully utilized than when the *g*-suit was depended on to compensate for hydrostatic forces. Thus, the basal resistance shift seems to reflect the cardiovascular state of the subject during various types of *g*-stress (COHEN *et al.*, 1957a).

3. *Basal skin resistance changes in hemisympathectomized dogs.* In order to clarify the role of vascular and autonomic nervous system factors in the above noted resistance changes, a series of experiments was initiated utilizing hemisympathectomized dogs. The usual placement of electrodes was modified so that the resistance of each foot could be measured simultaneously utilizing two separate meters. In this experiment, one electrode was placed on the foot pad and the second electrode on the hip of the ipsilateral side. The animal (having recovered from his hemisympathectomy) was placed on the animal rack and positioned so that during acceleration the centrifugal forces acted in a head to foot direction.

Because of the loss of sympathetic fibres on the sympathectomized side, it was considered that the leg on that side would be most subject to blood pooling due to the absence of fibres to convey compensatory reflex impulses responsible for vasoconstriction. It was hypothesized that if the basal resistance change was found to be greater on the sympathectomized side, this would suggest that non-neurogenic factors such as blood volume were a significant influence in determining basal skin resistance. If, however, no resistance changes or minimal changes occurred on the sympathectomized side, then it would strongly suggest that sympathetic impulses, rather than blood volume shifts were the more important determinant. Fig. 4 compares the amount of resistance drop at various *g*-levels during rapid and gradual onset acceleration on the sympathectomized and nonsympathectomized sides of a dog. These results clearly illustrate that the resistance change on the intact side far exceeded that on the sympathectomized side during both types of acceleration.

These data, although preliminary, would seem to suggest, at least in our experience to date, that blood volume shifts appeared to be of less significance than compensatory autonomic discharges (COHEN *et al.*, 1957a).

PERFORMANCE AND GSR

1. *Human tolerance to prolonged acceleration.* Using the human centrifuge at Wright Air Development Center, Wright Patterson Air Force Base, Ohio, five subjects underwent a series of nine runs distributed in random order, consisting of three runs at 2·5*g*; three at 4*g*, and three at 0·4*g* below the individual's protected blackout level. Fig. 5 shows the average GSR changes observed during these three graded stresses, and according to the frame of reference, suggests increasing activation at higher levels of *g*-stress. At 2·5*g*, the amplitude of specifics increased as did the number of nonspecific fluctuations, indicating that the subject was alert but not aroused to a point where his behaviour would be disorganized and his perceptions distorted. At 4*g*, the amplitude of specifics dropped slightly while the number of nonspecifics was elevated. Thus, the subjects were assumed to be aroused perhaps to the point where some decrement in co-ordination and goal-directed activity might

be anticipated. At $\times g$, which is $0{\cdot}4g$ below blackout, the amplitude of specifics had dropped sharply, while the nonspecifics had risen sharply, indicative of considerable CNS activation implying a considerable decrease in perceptive integrative ability, and perhaps a decrease in the ability to react to tasks in a meaningful and accurate manner. While the centrifuge rides were taking place, the subjects were asked to perform a tracking task, in which by means of a control stick they attempted to keep

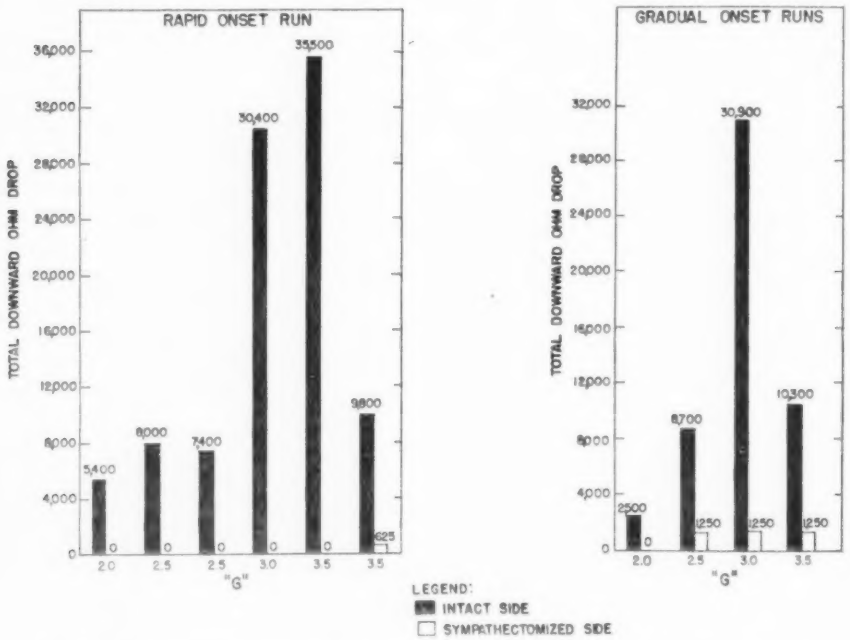
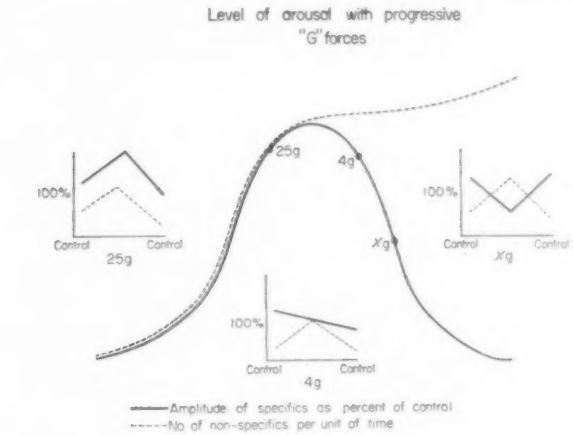


FIG. 4.—Basal resistance drop under g forces on hemisympathectomized dog. When the animal is centrifuged so that g-forces are exerted toward his limbs, the intact side shows large decreases in skin resistance, while the sympathectomized side is unresponsive.

zeroed two indicators into which were fed asynchronized sine waves. Performance was read in terms of amount of time on target. In accordance with the hypotheses developed above, a slight increase in performance was noted at $2{\cdot}5g$ from 37 to 43 per cent time on target, a slight decrease at $4g$ from 37 to 32 per cent and a considerable decrease at $\times g$ from 42 to 23 per cent time on target (ZUIDEMA *et al.*, 1956).

2. *Multiple psychophysiologic measures during gradual onset acceleration.* The aim of this experiment was to compare the response characteristics of fifteen subjects at different g-levels as well as to determine their overall tolerance to gravitational stress. As above, performance was assessed by ability to perform a dual pursuit meter type of task. Fig. 6 compares GSR and performance findings when subjects were stressed at $2g$ and $4g$. At $2g$ we see an increase of nonspecific GSR's and a slight decrease in the amplitude of specifics GSR's, suggesting an increase in activation to a point of slightly more intense arousal. The hypotheses developed would suggest a slight decrease in performance at this level as is, indeed, noted. At $4g$, the more

intense increase in nonspecifics, as well as the more abrupt decrease in amplitude of specifics suggested a very pronounced increase in arousal leading us to hypothesize that performance would drop considerably as, indeed it did, to 33 per cent time on target. These trends were noted for all subjects regardless of blackout level on the fourth run (and were found to be significant at the 0·01 level). However, subjects who eventually blacked out at higher *g*-levels showed less GSR arousal at 2 and 4*g*



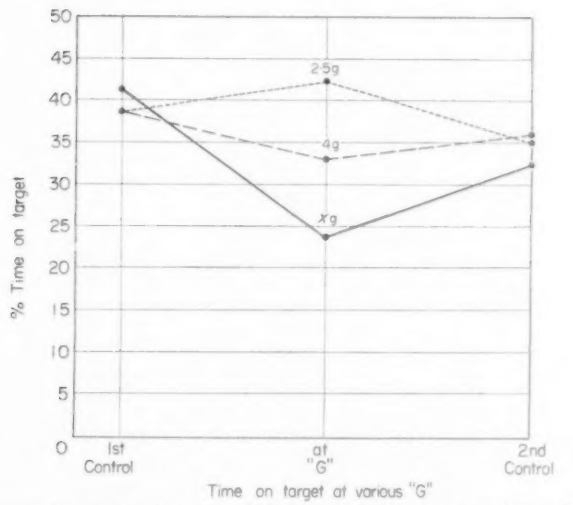


FIG. 5.—Time on target at various 'G'. Ability to perform a psychomotor task is increased in moderate arousal but decreases with more intense hyperarousal.

than those blacking out at lower levels. Further, those individuals who were later shown to have a low *g* tolerance showed a higher amount of arousal (as demonstrated by the GSR) during the control period than did those who later were shown to have high *g* tolerance. Similarly, throughout the runs, the low *g* group's arousal level during acceleration was much greater than that of the high group, although the physiologic stress was much less intense (COHEN *et al.*, 1957b).

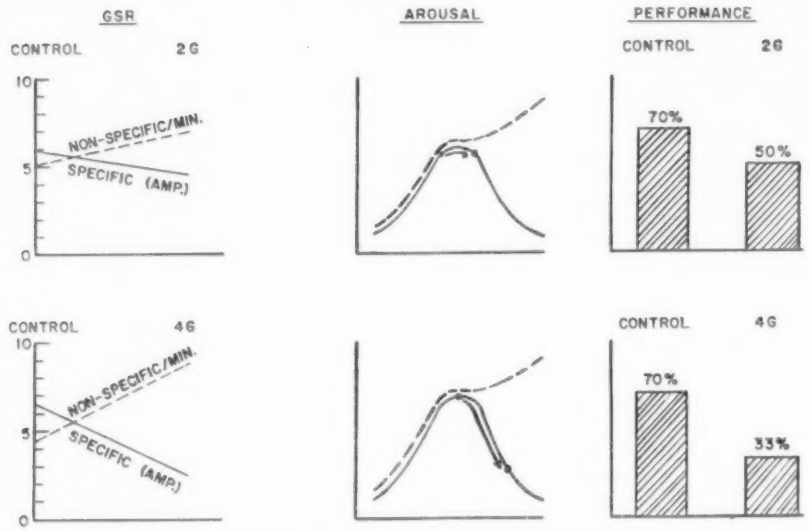


FIG. 6.—GSR arousal and performance. Small decrement in performance is seen with moderate hyperarousal and a larger decrement in performance with more intense hyperarousal.

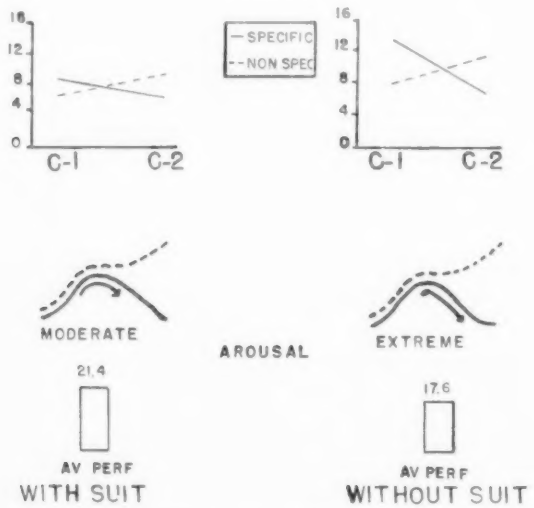


FIG. 7.—GSR arousal and performance under *g* forces with and without *g* suit protection. As in Fig. 5 and 6 above performance is related to GSR indices of 'arousal'—less arousal and better performance with the *g*-suit are seen.

3. *Psychologic and bioelectric assessment of g-suit protection.* Six subjects donned an anti *g*-suit and each was centrifuged on two different occasions (ten runs at 3*g* for 30 sec, each exposure being preceded by a 3 min control and rest period), once with the suit inflated and once with it uninflated. Performance was assessed as noted above, and average GSR findings and performance of all the subjects were compared (Fig. 7).

With *g*-suit protection it was noted that the effect of each exposure was a moderate decrease in amplitude of specific GSR. The frequency of the nonspecifics, at the same time, showed a moderate increase, suggesting moderate hyperarousal in response to the centrifuge stress. Performance of subjects protected with the suit was about 21 per cent time on target. GSR findings of subjects when unprotected revealed far greater increase in frequency of nonspecific fluctuations and a much more abrupt decrease of amplitude of specific GSR's suggesting a more extreme central nervous system activation. At the same time the performance decreased more than during the protected stage (sig = 0·001). The findings suggested that more arousal occurred during the unprotected centrifugations, indicating that this was a more stressful situation for the organism, and was associated with measurable performance decrements (SILVERMAN *et al.*, 1957c).

PERCEPTUAL THRESHOLD VARIATION AND GSR

The work reported above had suggested that psychomotor performance was related to the 'level of arousal' as indicated by the GSR. Since the ability to *perceive* as well as to integrate and perform goal-directed activity was also considered to be related to the level of arousal, a project was begun to test whether variations in perception would be noted with differing levels of arousal.

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Although only three subjects have been run, the results are considered to be suggestive enough to be reported here. Gross thresholds to perception of 'touch' were determined by gradually increasing the dose level of a discrete electric shock delivered to the left ankle. A specific GSR occurring at least twice in relationship to given shock level (whether or not the subject pressed a button indicating that he felt the stimulus) was considered to be a rough estimate of the perceptual threshold. Attempts were then made to give the same stimulus in random order when the level of arousal (as indicated by the number of *nonspecific* GSR's in the immediately preceding 10 sec period) was altered. Lowered levels of arousal ($NS = 0$ and 1) were obtained by allowing the subjects to rest. Increased levels of arousal ($NS = 2$ and 3) were obtained by either taking advantage of spontaneous changes or by stimulating the subject to greater arousal.

Thresholds obtained were, of course, different for each subject, but in each of the three cases the incidence of response to the stimuli was directly related to the number of nonspecifics in the preceding 10 sec period.

The results of each subject shown in Table 1 have been averaged for the three subjects in Fig. 8. Here it can be seen that as the level of arousal (number of nonspecifics) increased the subjects responded to a higher proportion of the 'threshold' stimuli.

There is some suggestion that stimuli 15 per cent below the originally obtained threshold evoked no responses when $NS = 0$, but with an increased number of nonspecifics ($NS = 1$) responses began to be evoked. However, this data is incomplete, since no stimuli were done at $NS = 2$ and 3. It is, further, suggested that stimuli 15 per cent stronger than the original threshold produced responses to all stimuli.

It was also noteworthy that the average *amplitude* of GSR (specifics) responses to the electrical stimuli increased in each subject when increased numbers of nonspecifics were present as noted in the last column of Table 1.

This data reflects the 'left half' of the 'arousal curve' shown previously. Presumably

Table 1.—Perceptual threshold variations and GSR

	Number of stimuli	Number of specific responses	Mean amplitude (mm)
Subject I			
$NS = 0$	10	0	0
$NS = 1$	6	4	5
$NS = 2$	7	7	15
$NS = 3$	4	4	18
Subject II			
$NS = 0$	4	1	1·8
$NS = 1$	6	4	2
$NS = 2$	11	9	7
$NS = 3$	4	4	9
Subject III			
$NS = 0$	6	3	3·6
$NS = 1$	3	3	15
$NS = 2$	2	2	15
$NS = 3$	3	3	15

if the subjects could have been aroused further, one might have begun to see a lowering of amplitude (i.e. as the subject reaches the 'right side' of the arousal curve). Thus, these preliminary data suggest that perceptual thresholds depend heavily on the level of arousal which should therefore be taken into account in any work of this nature.

The preceding work appeared to suggest that perceptive, integrative capacities as well as the ability to perform appropriate goal-directed activity were indeed related in a meaningful, predictable way to the GSR findings when they were interpreted using the 'arousal' framework. While the above data is not considered to be complete

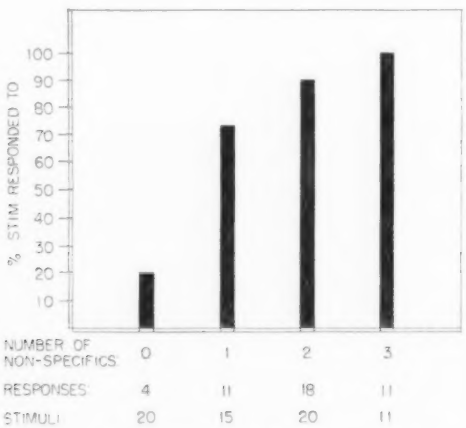

Fig. 8.—Percentage of stimuli responded to and number of nonspecific GSR. More 'threshold' stimuli are responded to when alertness level is raised.

in any sense, and although work is proceeding which in essence continues to explore the validity and reliability of the basic hypotheses, it may be profitable now to direct attention to a series of psychophysiological investigations performed using the present conceptualizations.

AFFECTIVE AROUSAL AND THE GSR

Affective arousal variations

In order to explore the sensitivity of the GSR to changes in affective arousal, a series of experiments employed a group of thirty-seven neutral and 'charged' words recorded on magnetic tape. These were presented to five subjects on three occasions, the first two occasions being used to assess the average responsivity as well as the variations of response. Psychiatric interviewing prior to the third occasion, which aimed at lowering or increasing the affective arousal associated with certain of the recorded words, appeared to be successful. In other words, when attempts were made to lower the 'arousal' in connexion with a word, the GSR response to that word was decreased. The converse was also true. This experiment further revealed the expected higher responsivity to 'charged' than to neutral words. In one subject attempts to utilize different psychotherapeutic techniques during the interviewing resulted in increased GSR responsivity when the subject's attention was called to the word, no change in GSR when authoritative suppressive techniques were used, and a decrease in GSR responsivity when interpretation and working through of the anxiety in connexion with the word was employed. The experiment further illustrated the increased total responsivity of subjects (i.e. the diffusion of responses) following an arousing stimulus.

Thus, one subject responded to 20 per cent of the first twenty words with an average amplitude of 2·2 mm and an average number of nonspecifics of 0·9 (per 10 sec) during this period. To the twenty-first word, 'masturbation', the subject gave a 63 mm response followed by three nonspecifics. This change in his arousal level persisted, and he then responded to 87 per cent of the last sixteen words (although there were no more charged words among these last sixteen than among the first twenty words) with triple the amplitude (9 mm) and twice as many nonspecifics (18) in the 10 sec periods following each of these words (COHEN *et al.*, 1956).

Analysis of the general group figures indicates that the subject population was more reactive to specific words while there was a decrease in overall responsivity on the third run.

It is interesting to note that previous workers describe a decrease in the number of words responded to as well as the amplitude of response on successive runs. In these previous experiments no attempts were made to increase or decrease responses between or during the runs. The decreased responsivity was attributed to an accommodation effect and a decrease in 'startle' produced by words (DAVIS, 1930; MCCURDY, 1950). Contrary to this, during the second run our subjects responded to more words (70 per cent in first experiment and 95 per cent in second) with a higher level of nonspecifics (30 per cent more nonspecific GSR). Furthermore, following interviews, the amplitude of responses to specific words was increased, although the number of words responded to and the number of nonspecifics decreased.

It is felt that the change in GSR responsivity to word stimuli is more a function of the affective connotation of the stimulus and the level of arousal of the subject

rather than a result of accommodation effects. Although startle or surprise is an effective stimulus in general, it was not felt that this factor would adequately explain the results obtained.

Affective arousal and peripheral venomotor tone

In this project an attempt was made to evaluate whether the arousal of subjects by psychologic stimuli could alter venous tone. To this end, twelve volunteer subjects were exposed to recorded verbal stimuli while they were resting in an isolated, sound-attenuated area. Verbal stimuli were bland or neutral expressions and 'charged' words or expressions. In addition, silent periods were introduced as a further control.

Venous pressure was measured in a forearm vein segment isolated by inflated cuffs above and below the selected segment. Into the vein segment was placed a

TABLE 2.—GSR AND VENOUS PRESSURE CHANGES WITH VERBAL STIMULI
(data is presented in group medians)

	Control period			Bland word			Charged word		
	Before	During	After	Before	During	After	Before	During	After
Skin resistance									
Specifics					29 mm			60 mm	
No. of non-specifics per minute	4·3		2·6	3·0		3·1	4·2		5·8
Venous pressure in cm H₂O		2·7			6·9			11·6	

polyethylene catheter attached to a water manometer. With this preparation, any change in venous pressure would be a function of alterations in the degree of veno-constriction mediated by autonomic fibres. Non-parametric analysis of the data indicated that venous pressure changes were significantly greater following the introduction of charged words than following bland expressions, which were, in turn considerably higher than silent control periods (sig = >0·01).

Specific skin resistance responses associated with the presentation of the above words were significantly greater (sig = 0·01) after charged than neutral expressions. Comparison of pre- and post-stimulus bioelectric recordings revealed a higher number of nonspecific fluctuations in the post-stimulus periods following charged words, no change after bland words and a decreased level after silent periods (sig = >0·01) (Table 2).

It was quite interesting that subjects who were initially highly aroused and maintained this level throughout the experiment demonstrated less venous pressure change than those subjects who were more relaxed, but alerted by the specific stimuli (Fig. 9). These data suggested that, in these subjects, venous constriction had already occurred in association with the alert state and increased sympathetic tone. GSR information thus accounted for what would otherwise be a paradoxical finding.

Independent psychiatric interviewing following the experiment revealed that the reactions of individual subjects were not merely a function of the type of stimulus,

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but were closely related to the personal meaning of the stimulus for each subject. Thus, maximum responses were given to those phrases which had the greatest personal meaning for the subject.

In this experiment, it was felt that the psychologic stimuli resulted in an increased level of central nervous system arousal, leading to an increase in sympathetic nervous system excitation resulting in the venoconstrictive pressure changes as well as the GSR results noted (BONDURANT *et al.*, 1958).

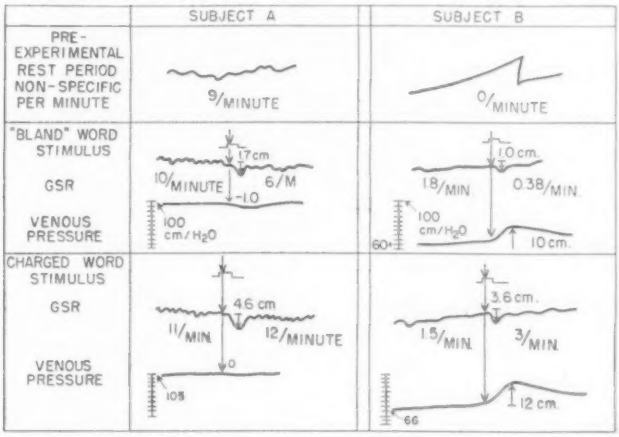


FIG. 9.—Venous pressure change at different levels of arousal. With intense arousal already existing the veins may be constricted during the control periods and therefore show less apparent constriction than a subject who is less aroused.

Psychophysiologic responsivity in the elderly

The suggestion that the elderly have a reduced CNS response capacity prompted the following study, designed to explore sympathetic activity and CNS arousal. Ten male college students (ages 20–24) and ten male elderly subjects (ages 60–70) were matched for physical and mental health, intelligence quotient and educational level. After a baseline period of galvanic skin reflex recording, a series of eighty-four auditory stimuli were presented at 20 sec intervals. Stimuli included tones, neutral phrases, phrases 'charged' for the young (e.g. 'study more and play less') and phrases 'charged' for the elderly (e.g. 'old and useless').

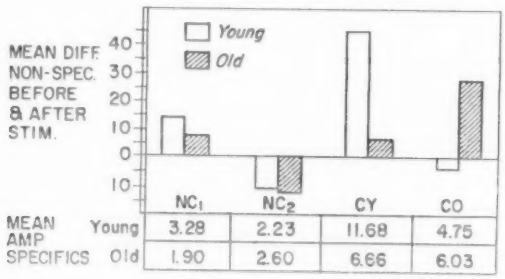
The elderly group showed a decreased mean amplitude of GSR as well as decreased numbers of 'spontaneous' GSR fluctuations. Previous work had related this finding to decreased CNS arousal, which also correlated with the decreased ability of the aged subjects to recall portions of the experiment. Indeed, the correlation in general between the 'recall' score and 'arousal' was high.

In spite of this overall decreased responsivity in the elderly group, analysis of their responses to 'charged' phrases suggested that they are capable of responding (see Fig. 10). Certainly no difference in latency time could be found between the two groups.

Charged phrases (for the young—*C.Y.* and for the old—*C.O.*) were given in the third period of the experiment. NC_1 and NC_2 refer to two separate 'neutral' phrases.

Comparison of nonspecifics before and after these four types of phrases revealed moderate increase after the first neutral phrase and moderate decrease after the second neutral phrase for both old and young subjects. There was also essentially no difference in the amplitude of responses (specifics) to noncharged words in the two groups.

Comparison of specific responses for the charged phrases, however, revealed that the young responded selectively to phrases charged for the young, whereas the old



MEAN AMP SPECIFICS		NC_1	NC_2	CY	CO
	Young	3.28	2.23	11.68	4.75
	Old	1.90	2.60	6.66	6.03

FIG. 10.—GSR responses in the elderly. (NC_1 and NC_2 = bland phrases. CY = phrases charged for the young. CO = phrases charged for the old.) Demonstrates selective responsivity in the elderly.

group appeared to respond with less discrimination to both types of charged phrases. However, this group did discriminate well in terms of their nonspecifics responses. Discrete differences in nonspecifics appeared with the charged phrases. The young responded more to phrases charged for the young and the old more to phrases charged for the old. It may be that the aged subjects were able to discriminate less rapidly than the young, but a moment later as the import of the stimulus was appreciated, they responded with heightened activation and increased nonspecific fluctuations. In other words, when the stimulus was appropriate the apparent lowered responsivity disappeared, albeit in a delayed fashion (SILVERMAN *et al.*, 1958; SHMAVONIAN *et al.*, 1958).

Psychodynamic aspects of this experiment are reported elsewhere (COHEN *et al.*, 1959a).

Arousal and the response to drugs

Ten subjects were run in this series. The subject was seated in a dimly-lit chamber, GSR electrodes were applied to his feet, a photosensitive plethysmograph (SHMAVONIAN, 1959) was placed on his finger and standard limb leads were attached for EKG measures. The subject was told that he would receive small injections representing minimal doses of various noxious substances and that his records would be watched closely, but that marked effects of any type were not expected.

The investigators then left the room and a 5 to 15 min period was allowed so that the subject's records would become quiescent or stabilize. Following this, the subject's 'shock level' was established, that is, the subject was given a series of perceptible but not painful shocks, and the shock level was increased to a point just below the pain threshold (subjects were previously told that they would receive the

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shocks). The records were again allowed to stabilize prior to the control period, a 3 min period in which the subject was given three shocks randomly distributed.

An investigator then entered the room to administer the first injection, a subcutaneous injection of 0·2 ml of water in the right deltoid region. Sponging, needle penetration and actual administration reactions of the subject were noted. The injection period, which usually required 12–16 sec, was marked on the record, and this data was compared only to other injection periods.

The period from 30 sec to 6 min after the injection was considered the period representing the immediate acute effects of the injection. About 12 min post-injection the subject was given a total of ten randomly-timed electric shocks in a 10 min period. Following the tenth shock, the room was again entered and another injection given.

TABLE 3.—GSR AROUSAL AND CARDIAC RATE CHANGES FOLLOWING INJECTIONS OF WATER, MECHOLYL AND ADRENALINE

	Control	30 min-6 sec following injection of 0·2 ml water	30 min-6 sec following injection of 0·2 ml mecholyl (10 mg)	30 min-6 sec following injection of 0·2 ml adrenaline (0·2 mg)
Number of nonspecific GSR per min	9·3	8·9	10·6	4·1
Cardiac rate per min	69·6	65	94	71

This procedure was repeated so that each subject received the same sequence of injections in this experimental series: 0·2 ml of water, 0·2 ml of mecholyl (10 mg), and 0·2 ml of adrenaline (0·2 mg). The period representing the immediate acute effects of injection was evaluated following each injection. (It is, of course, obvious that in future experiments the sequence of injections should be carried out in a latin square design.)

Despite individual variations, there was a remarkable consistency in the response patterns of the subject population. Hence, the results are presented as averages for the group (see Table 3).

If the data are observed in terms of the vascular system, the results seem paradoxical. For example, the heart rate after mecholyl injection was greater than during the post-water injection period or the post-adrenaline period, although one of the supposed direct effects of mecholyl is to slow the heart. The heart rate after the water injection is only slightly less than that following adrenaline in spite of the well-known fact that adrenaline causes a tachycardia. However, perusal of the skin resistance data and the subjective responses of the subjects clarifies the situation considerably. All subjects reported being more anxious during the period of water injection which preceded the injection of mecholyl and adrenaline. This subjective report was substantiated by the changes in skin resistance which showed greater arousal during the post-water injection period than the adrenaline period.

The final common path of impulses considered responsible for changes in skin resistance is probably the sympathetic nervous system. Hence, the number of skin resistance changes and the heart rate both partly depend upon sympathetic nervous system discharges. The adrenaline injection was given last. Despite the fact that adrenaline is a stimulant to the central nervous system as well as a direct stimulant to the cardiac muscle, the physiologic indices of arousal increased less following the adrenaline injection than following the water injection. Of course, the subjects were psychologically most relaxed during the former period.

The marked increase in pulse rate following the mecholyl injection was obviously not a direct cardiac effect of mecholyl (which slows the heart), but was most probably due to the fact that mecholyl dilated blood vessels causing a drop in blood pressure which then led to a reflex compensatory increase in heart rate. Most of the subjects reported intense anxiety and discomfort following the mecholyl injections associated with flushing sensations, feeling of pressure on the chest, some breathing difficulty, and increase in gastrointestinal activity. Arousal indicated by skin resistance was far more intense during this period than any other period. The onset of the increased heart rate occurred at the same time that one would expect absorption from the injection site to begin and physiologic change and subjective sensations to be initiated. This was substantiated in part by the sudden shift in arousal which occurred at the same time the heart rate increased. The increase in arousal persisted for the time which is the expected duration of the effect of the drug.

Plethysmograph findings. The amplitude of the pulse wave in the plethysmographic record was frequently reduced after injections of mecholyl. At this time changes in finger volume in response to shock decreased or disappeared. [A decreased amplitude of pulsewave for whatever reason was usually associated with an apparent decreased (plethysmographic) responsivity to shock.]

In any single series of shocks, that is, either in the control period or following one of the injections, specific GSR (in response to shock) seldom disappears entirely. The plethysmographic changes in response to shock, however, may disappear as a series of shocks continue. The finger volume changes in response to shock are virtually always accompanied by GSR changes, but specific GSR deflexions occurred in the absence of discernible finger volume changes. In this sense, then, the threshold of GSR response seems lower than the threshold of plethysmographic response.

In terms of the spontaneous fluctuations in both parameters, that is GSR and finger volume, although there was a frequent parallel response to shock, spontaneous fluctuations in either parameter seemed to occur independently, and the independent fluctuations were at times of considerable amplitude. This association of a GSR and plethysmographic response can occur in either direction, that is, a significant change can occur in GSR without accompanying finger volume change or *vice versa*.

The GSR and plethysmographic nonspecific oscillations differed in rate and rhythm from those attributable to respiratory changes. However, there may well be a significant relationship between respiratory activity and some of the spontaneous fluctuations. In future experiments a continuous record of respiration while GSR and plethysmograph data are being collected would be valuable.

Further details regarding the plethysmographic findings in this experiment will be reported elsewhere. In the portion of the results reported here, however, it seems clear that the experiment demonstrated the sensitivity of the GSR in identifying

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moment-to-moment fluctuations in a subject's state under various conditions and allowed a better understanding of seemingly paradoxical responses to drug injections.

Relationship of GSR activation and changes in somatic response

A considerable amount of work has been done recently both by the present investigators as well as others in exploring the concept that specific emotions are related to specific physiologic changes (AX, 1953; SILVERMAN *et al.*, 1957a,d; ZUIDEMA *et al.*, 1957; COHEN *et al.*, 1956b, 1959b). The adrenaline-like response of the individual experiencing fear, and his noradrenaline-like response when angry, illustrate this concept. However, in exploring the nature of these correlations it is important to consider a number of variables. Certainly the final somatic response seen is probably related to the initial vascular and endocrine levels measured. It is also important to consider the intensity of the associated affective arousal. Certainly a high degree of activation might be seen in both (fear and anger) affect states. The initial activation or apprehension, as well as the amount of arousal induced, may both play a role in determining the final response. Thus, although it seems quite definite that specific hormonal ratios as well as specific vascular patterns are found in association with different emotions, the amount of change in each one of these parameters also seems related to the intensity of affective arousal seen.

An example of this type of exploration may be seen in one of our experiments employing fifteen subjects. Each was placed in a darkened room and monitored with GSR and periodic automatic blood pressure determinations. Catechol amines were determined by urinary bioassay before and after the experiment. After baseline and control periods, during which a provoking verbal chastisement was introduced, the subjects were given (parentarally) 5 mg of mecholyl. Our results in this and similar experiments have been reported elsewhere and, in general, confirm the hypothesis of specificity of response (COHEN and SILVERMAN, 1959b). The aggressive mode of behaviour or the affect of rage was found in association to compensatory hypertensive responses to mecholyl and elevated urinary noradrenaline. On the other hand, subjects who revealed anxiety as the main affect had prolonged hypotensive vascular patterns in association with elevated urinary adrenaline excretions.

When the data was examined with reference to the amount of arousal as indicated by the GSR, the data suggested that the amount of hormonal and vascular change appeared related to the amount of arousal of the subject. For those subjects assessed primarily as being anxious, a trend was revealed toward a direct correlation between number of nonspecific GSR's and (a) amount of systolic blood pressure decrease, (b) amount of increase in adrenaline excreted (see Fig. 11). There was a similar trend between GSR and systolic blood pressure increase and between GSR and increase in noradrenaline for those subjects assessed as primarily angry or aggressive and in control. It should be emphasized that the writers do not believe that one should expect a clear linear relationship. This expectation could only be fulfilled in a system far simpler than that of man. Nevertheless, the trends noted do suggest increased responses in more highly activated subjects and represent leads for further investigation.

Recent publications of LACEY *et al.* (1953, 1958) represent major contributions to the understanding of psychophysiological relationships. It would be impossible to review LACEY's extensive work in this paper and it would seem essential that his publications be reviewed by anyone interested in the relationship of autonomic

nervous system responses and psychological functioning. However, some aspects of his work should be noted here because of their pertinence to our own investigations.

LACEY suggests that the number of fluctuations in skin resistance is an extremely important autonomic variable. However, his work in this area is mostly concerned with the identification of individual differences in the 'number of bursts' of spontaneous skin resistance changes while subjects are resting. These bursts are independent of

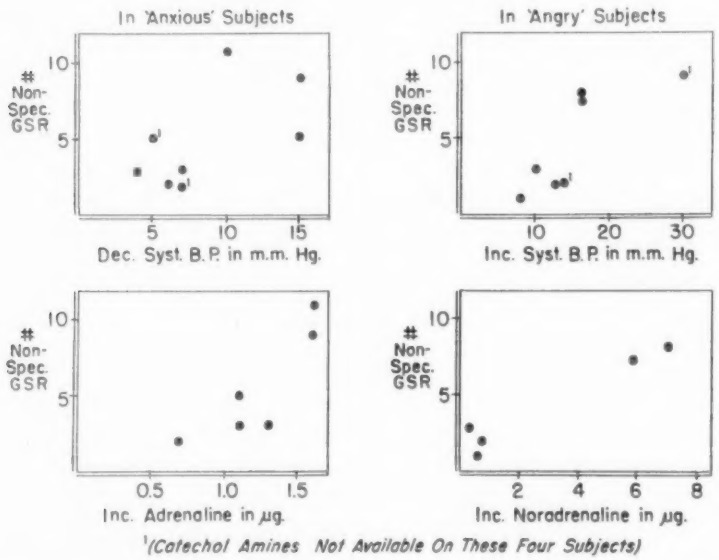

FIG. 11.—Degree of affective arousal and somatic responses. A trend toward a direct relationship between number of nonspecific and degree of hormonal and vascular changes is illustrated.

other autonomic variables (e.g. cardiac rate). Furthermore they occur without regard to the timed and specific events of the experiment. He also describes non-resting spontaneous activity as a reliable measure of individual differences but unlike resting activity exhibits systematic adaptation effects (this may be related to changes in the level of arousal). He points out that resting levels of 'sympathetic tonus' (or basal resistance levels) are reliable individual measures but are uncorrelated with the frequency of resting autonomic activity. However, his findings suggested that there was some relationship between changes in basal resistance and the number of spontaneous fluctuations. His findings were in agreement with those reported in this paper that a decrease in skin resistance was related to an increase in the number of spontaneous fluctuations.

It should be pointed out that the magnitude of skin resistance changes measured by LACEY's instruments is from five is ten times those on the records reported in this paper (i.e. 20–100 Ω fluctuations vs. 500–1500 Ω fluctuations). It may be that LACEY's findings are more concerned with gross fluctuations in autonomic rhythms which are related to individual autonomic system characteristics; while the smaller spontaneous fluctuations noted in this paper, which do not appear to be associated consistently with individual patterns, are related to transient changes in central

nervous system arousal. One of the most striking findings in LACEY's work was the relationship of the frequency of autonomic fluctuations (which the writers and LACEY feel represent the characteristic autonomic rhythms of the individual) to the frequency of occurrence of erroneous and impulsive motor responses. This led LACEY to construct a physiological model that relates autonomic fluctuations to hyperkinetic-impulsive aspects of behaviour.

SUMMARY AND CONCLUSIONS

Using a newly designed, highly stable and sensitive galvanic skin resistance meter it was possible to record and discriminate fluctuations in skin resistance of about 20–50 Ω, at the same time recording grosser shifts in the basal skin resistance. Preliminary work with the instrument and various drugs acting on the CNS suggested certain relationships with CNS arousal:

(1) The *number* of 'spontaneous' rapid GSR's increases in direct proportion as the individual is alerted or aroused.

(2) The *amplitude* of the GSR response to specific external stimuli increases with alerting but decreases when the individual is in a hyper-aroused state.

This series was designed to explore the applicability of this finding to psychophysiologic investigations.

A. *Basal resistance correlates*

In general all experiments agreed with previously noted findings that basal resistance was inversely related to arousal. The relationship of *nonspecifics* to the above was demonstrated using a random sample of seventy measurements. Two experiments explored the problem of the importance of blood volume shifts in resistance changes while a third experiment, using a hemisympathectomized dog, demonstrated the relative importance of an intact sympathetic nervous system and the relative lack of influence of blood volume shifts in causing resistance drops.

B. *Performance correlates*

In three separate experiments, subjects were exposed to the gross vascular stress of the human centrifuge. While GSR was being recorded before, during and after the hypotensive stress, they were asked to perform a continuous tracking task. Results agreed with the hypothesis. When the GSR suggested moderated alerting, psychomotor performance improved; when hyperalerting was indicated by the GSR, performance declined.

C. *Perceptual threshold variations*

One series of experiments (still in progress) demonstrated that response to threshold stimuli related directly to 'level of arousal' as measured by number of nonspecifics. Amplitude of responses to these stimuli was also directly related to number of nonspecifics.

D. *Affect correlates*

In three separate experiments subjects were exposed to affectively 'charged' words or phrases. Greatest arousal was noted in response to the most meaningful verbal stimuli as assessed by psychiatric interviews. In one experiment this correlated well

with concomitantly measured *venous* tone. In another investigation it was shown that psychiatric interviewing could *alter* the arousal as seen by GSR responsivity. In a third experiment aged and young subjects responded differentially to phrases 'charged' for the old and 'charged' for the young. Here too, rank order correlations were significant between arousal as assessed by GSR and ability to recall these phrases.

E. *Hormonal and vascular correlates*

Fifteen subjects participated in an experiment in which the subject was chastised verbally while GSR were recorded, urinary bioassays for adrenaline and noradrenaline were made before and after the experiment, and blood pressure and pulse were recorded automatically throughout the experiment. Although the *ratios* for these hormones varied according to the nature of the affect resulting in response to the stress, the increase in each hormonal level was related directly to the level of arousal as assessed by GSR. Similarly, degree of blood pressure change was related to GSR measures of 'arousal'.

In a variety of experiments then, GSR responsivity was found to correlate positively with psychomotor performance, intensity of affect, venous tone, retention and recall, catechol amine increases and degree of blood pressure variations. Although the specific nature of the relationship to CNS arousal is not yet clear, these results suggest that the GSR may be extremely useful in the evaluation of the quantitative aspects of stress responses.

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THE THEORETICAL AND EXPERIMENTAL APPLICATION OF A CONDITIONING MODEL TO A CONSIDERATION OF BRONCHIAL ASTHMA IN MAN*

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ASTHMA AS A LEARNED PHENOMENON

THERE is considerable clinical evidence to suggest that psychological factors are relevant to the genesis of some asthmatic attacks (MILLER and BARUCH, 1950; BASTIAANS and GROEN, 1954) although, here again, there is no agreement as to their relative importance with regard to other causal factors in contributing to the extent or severity of the disorder. More specifically, there is evidence, some of it anecdotal (e.g. DUNBAR, 1946), to suggest that asthmatic attacks may follow specific emotional events. HURST (1943) believed that any state of anticipation, either positive or negative, is the emotion most frequently associated with an attack. FRENCH and ALEXANDER (1941), in their review of the literature, list seven common situations which might act as precipitants.

Human beings probably respond consistently, under comparable circumstances, to psychogenic and sensory stress situations. According to LACEY and his colleagues (LACEY and VAN LEHN, 1952; LACEY, BATEMAN and VAN LEHN, 1953), strain is always distributed unevenly, and each individual exhibits a characteristic and consistent response pattern; some body systems reacting excessively, others minimally. WOLF *et al.* (1950) have demonstrated that in a variety of allergic conditions, including bronchial asthma, it is possible to modify the allergic symptoms both for the better and otherwise, by appropriate stressful stimuli. The relevance of stress to the production of experimental asthma in animals has been discussed extensively by LIDDELL (1951), who comments to the effect that respiratory asthmatic type dysfunctions are an invariable manifestation of chronic experimental neuroses in animals. GANTT (1941) was able to produce similar symptoms in a dog by mere proximity to an experimentally produced stressful environment. Similarly, HERXHEIMER (1953) found that asthmatic reactions resulted merely by placing asthmatic individuals in situations in which they had previously been exposed to allergens. Supporting evidence of a similar nature has more recently been reported by DEKKER and GROEN (1956).

Findings such as these suggest that some attacks of bronchial asthma may profitably be understood, at least in part, in terms of a learning theory or conditioning model. In this respect, the studies of the NOELPPS (1951, 1951a, 1952, 1954) are highly illuminating. They exposed guinea pigs to an aerosol of antigen or histamine, and paired these unconditioned stimuli with sound or other sensory stimuli as their conditioned stimulus. With this technique they were able to develop conditioned asthma-like breathing responses in some cases after as few as five reinforcements.

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According to SELYE (1950), exposure to a stress situation is supposed to produce a significant increase in the ease of establishment and retention of certain conditioned responses. When the NOELPPS exposed their guinea pigs to the protracted sensory stress situation of continuously flashing bright lights, a conditioned breathing response became easier to establish. Another important observation of the NOELPPS was that 'spontaneously' occurring conditioned asthmatic reactions sometimes occurred after asthma trials without any apparent specific pairing of stimuli.

OTTENBERG *et al.* (1958) were also successful in the production of conditioned asthmatic responses in the guinea pig. What is of even more interest is that these workers report individual differences in the susceptibilities of their animals to asthmatic attacks. From this observation they infer that there might be 'inherent biological differences in disease reaction patterns', a conclusion consistent with the aforementioned concept of individual and characteristic reaction profiles to stress. It would be of interest to extend this inference to an experimental consideration of individual differences in guinea pigs in their abilities to form and retain conditioned asthmatic reactions. Unfortunately, OTTENBERG *et al.* (1958) were unable to isolate, with any degree of assurance, those specific elements in their experimental situation to which the guinea pigs became conditioned; they suggest that possible conditioning stimuli were the chamber itself or internal cues within the animals.

As has been well pointed out by OTTENBERG, it is premature to assume, despite striking resemblances, that so-called conditioned asthmatic attacks produced in guinea pigs are completely analogous to bronchial asthma in man. Fortunately, however, there is at least one study (DEKKER *et al.*, 1957) in which conditioned asthmatic attacks in man have been produced in a laboratory setting. In this study the authors do not specifically consider the very relevant problem of the extent to to which the ability to develop conditioned asthmatic attacks occurs either in asthmatics or in normals. They imply that this ability is somewhat rare, but there is clearly a need for much further research. The more fundamental studies should first compare the ease of formation and extinction of asthmatic conditioned responses —or, failing this, changes in respiration—in asthmatics, various neurotics and normals. The ability to form conditioned asthmatic and respiratory responses in asthmatics and in non-asthmatics, should then be further compared with the ability of these same subjects to form other conditioned responses of a totally different nature. The study reported in the present paper is, therefore, of limited direct value since these groups were compared only for eyelid conditioning which, at a superficial inspection, is only remotely associated with respiratory dysfunction. In terms, however, of the theoretical model to be discussed shortly, a model which relates conditioning to personality, this limitation is not as serious as first appears. But first it is necessary to consider briefly the vexatious matter of the literature pertaining to the so-called personality of the asthmatic.

THE "ASTHMATIC PERSONALITY"

Until the "allergy" hypothesis became dominant in the second quarter of the present century, bronchial asthma had always been regarded as a disease of largely psychogenic origin. In the post-war era attention reverted to the importance of emotional factors in the aetiology of this disease and considerable interest was displayed in the possibility of isolating the 'asthmatic personality', one hypothesis

being that asthma occurs predominantly among patients with a certain common core in their personality structure (BASTIAANS and GROEN, 1954). According to this concept, bronchial asthma is an organic disease with a predominantly psychogenic aetiology, a 'psychosomatosis' (GROEN, 1951). The different traits which together constitute this common asthmatic personality core are apparently not in themselves specific and each trait can also be found in patients with other psychosomatic or psychoneurotic disorders. But it is the configuration in a certain quantitative proportion which is supposed to give the asthmatic personality its unique and specific nature (BASTIAANS and GROEN, 1954).

The notion of specificity in psychosomatic disorders is too complex to be treated adequately here, particularly since the present concern is not with the specificity of the asthmatic personality but with its existence *per se*. Most of the studies attempting to isolate the asthmatic personality have, of necessity, to evaluate the asthmatic *after* the dysfunction is established. Drawing inferences about the pre-asthmatic personality then becomes highly speculative and any common core of personality data lends itself to the highly plausible explanation of being a result, rather than a possible cause, of the asthmatic disorder. For example, LEIGH (1956) followed a group of 150 asthmatics for seven years and was forced to conclude that the only personality core common to the group was probably the result of the disorder itself. For these reasons, an acceptable study must either examine asthmatics prior to the onset of their disorder or make use of psychophysiological tests which measure enduring characteristics unlikely to be modified by asthma and which have been independently shown to be related to personality and behavioral traits. REES (1956) reports one study in which the former approach was partially attempted, where patients were examined very soon after the initial onset of detectable asthmatic symptoms and in whom the common personality trait was found to antedate the onset of the asthma. As far as the present writers are aware, no study (other than that to be reported here) has utilized the latter approach and made use of psychophysiological tests which have a clearly demonstrated relationship to personality variables.

The nearest approaches to such an orientation have been the few restricted studies on the electroencephalographic response pattern of the asthmatic. Thus RUBIN and MOSES (1944) found that their sample of asthmatics tended to have a dominant alpha rhythm and DEES and LOWENBACH (1948, 1951) found that their sample of asthmatics tended to have a dysrhythmia which is predominantly occipital. Unfortunately, despite a recent comprehensive and excellent review by MUNDY-CASTLE (1958), the assumption that the promising relationships between various EEG and personality measures have been satisfactorily elucidated would be both unrealistic and premature. It does, however, seem probable that there are some consistent relationships between the two types of measure, and that, eventually, EEG studies of the asthmatic will be able to shed further light on the problem of the asthmatic personality.

Since the majority of the existing personality studies are therefore unacceptable methodologically it is of little value to pursue them in any detail. Additional limitations to their value stem from a general tendency to ignore the principles of experimental design and statistical control, and to lean too heavily on highly subjective test materials such as Rorschach records and clinical judgement. The majority of workers agree that the asthmatic tends to be above average on most criteria of neuroticism

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(e.g. DUNBAR, 1938; MCDERMOTT and COBB, 1939; LEIGH, 1953; LEIGH and MARLEY, 1956; NEUHAUS, 1958). Some describe this neuroticism in specific terms such as 'emotionally hypersensitive, . . . impulsive . . . and egocentric . . .' (BASTIAANS and GROEN, 1954) or 'cyclothymic' (REICHMAN, 1922; STOKES and BEERMAN, 1940; REES, 1956).

This agreement that the asthmatic is neurotic does not extend to a consideration of the *kind* of neurotic personality the asthmatic is supposed to possess. For example, according to some Rorschach workers (MCDERMOTT and COBB, 1939; SCHATIA, 1941) the asthmatic possesses compulsive characteristics. TRUETING and RIPLEY (1948) found depression to be the most common symptom, while in ROGERSON's cases, (1937) over-anxiety was the presenting feature. In the sample studied by TRUETING and RIPLEY (1948) hysterical indifference was a feature of the majority, whereas REES (1956) found the hysterical personality type was rare. Of the group studied by POLLNOW *et al.* (1929) over 50 per cent apparently possessed 'psychopathic features'. DUNBAR (1938) using a psychoanalytic form of therapy for her asthmatic patients, found that they tended to be obsessional neurotics. From these studies it is difficult, apart from recognizing a tendency towards a general neuroticism, to arrive at any conclusions even concerning the post-onset personality of the asthmatic; it is impossible to come to any conclusion as to the pre-morbid personality of the asthmatic.

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THE PRESENT EXPERIMENT

The experiment to be reported here was conceived as a preliminary attempt to provide information on two topics.

(A) The relative ease of conditioning of the asthmatic as compared with other groups.

(B) The basic personality of the asthmatic as compared with other groups. (i) with respect to enduring fundamental personality traits, presumed to be a life-long, probably constitutional, property of the individual. (ii) with respect to the present post-asthmatic personality of the individual concerned.

The theoretical background has been described by one of the writers in some detail in a number of publications (FRANKS, 1956b, 1957, 1958) and will therefore be only summarized here. Working within an Eysenckian framework (see EYSENCK, 1957), in which personality is described in terms of orthogonal dimensions of personality, in particular those of introversion–extraversion and neuroticism, an attempt was made to relate certain aspects of personality to certain psychophysiological measures. Utilizing some of the concepts of HULL and of PAVLOV, it was argued that the same central processes which partly determine personality would also determine part of a subject's response, on a variety of motor and other psychophysiological performance tasks. Of direct relevance to the present paper was the prediction that conditionability was unrelated to neuroticism, but closely related to introversion–extraversion; introverts conditioning readily and well, and extraverts conditioning slowly and poorly. Using the conditioned eyeblink this prediction has, in general, been shown to hold for both normal and abnormal subjects.*

* Several critics have aspired to cast doubt upon these and related findings, and upon the dimensional system of EYSENCK. The present article is no place to list either the many and sometimes curious objections of these critics or the detailed and effective replies of EYSENCK and his associates. The interested reader is referred to the relevant pages of various issues of *The Journal of Abnormal and Social Psychology*, the *British Journal of Psychology*, the *British Journal of Medical Psychology* and the *Journal of Mental Science*, etc.

EYSENCK (1957) has demonstrated that introverted neurotics tend to suffer from anxiety states, reactive depressions, or obsessive-compulsive states, whereas extraverted neurotics tend to have largely hysterical or psychopathic features. Bronchial asthma may, or may not, change a person's manifest personality but it seems extremely unlikely that it can drastically change the functioning of central processes. Asthmatics may therefore be compared with other groups by studying their behaviour in respect of a direct psychophysiological measure of central processes which has already, and independently, been shown to be related to personality traits. Eyelid conditioning is such a measure.

In addition, if there is—and this has not been confirmed as yet—a general factor of conditioning, then individuals who are readily able to acquire or to extinguish one kind of conditioned response, should similarly be readily able to acquire or extinguish other conditioned responses. Consequently, the ease of acquiring conditioned asthmatic attacks may be indirectly—although less effectively—measured by studying the abilities of these individuals to acquire other conditioned responses, such as the conditioned eyelid response. Eventually, it may be possible to detect asthmatic patients suited for successful conditioned response therapy (such as removal or extinction of the harmful conditioned stimulus) by means of such laboratory tests of conditioning.

Subjects

(a) Twenty in-patient neurotics; 10 primarily dysthymic, with predominant features of anxiety or obsessive-compulsions; 10 with predominantly hysteric reactions. None of these patients had any past or present evidence of psychosis or brain damage and selection was at random from the available Maudsley and Bethlem Royal Hospitals population for whom data were available. The dysthymic and hysterical diagnoses were distributed equally among the two sexes.

(b) Twenty out-patient neurotics; 10 dysthymic; 10 hysteric features, selected as above.

(c) Twenty asthmatics, suffering from bronchial asthma and attending the Maudsley Hospital as out-patients; 12 were females, 8 were males, of mean age 27 years and age range 16–48 years. The duration of the asthma was 1–5 years in 1 patient, 10–20 years in 14 patients, and over 20 years in 5 patients. Sixty per cent gave a family history of allergy and 50 per cent a personal history of allergy. Neurotic manifestations were present in 70 per cent of the group and a family history of psychiatric illness in 55 per cent. A full allergic, psychiatric and medical examination had been carried out on all patients, including chest X-ray, total and differential white cell count, skin tests, EEG, Wechsler–Bellevue and Raven's Matrices. These 20 patients were an unselected sample from a group of approximately 200 asthmatics who attended the clinic of one of the writers (D.L.), with the exception that the 20 asthmatic patients included in the study happened to be the next 20 consecutive referrals, during the period of the study, who showed evidence of neither brain damage nor psychosis.

(d) Twenty normal subjects, 10 male, 10 female, selected at random from a pool of available normal volunteers, ranging in age from 16 to 45 years. None of these subjects were test sophisticated and none had any appreciable knowledge of psychology. They consisted largely of office workers, apprentices, nurses, porters, occupational therapists and students.

None of these four groups differed significantly in mean age or intelligence, as measured by the Matrices.

Procedure

Subjects were first given the Maudsley Personality Inventory. This is a questionnaire measure of introversion-extraversion (E) and neuroticism (N), a high E score indicating extraversion. It has been described in detail elsewhere (JENSON, 1958) and used successfully in a number of personality studies. The subjects were then taken into a specially constructed, sound-proof conditioning laboratory (FRANKS, 1955) and conditioned by a technique of eyelid conditioning which has been described in detail elsewhere (FRANKS, 1956a). It is sufficient to state here that the unconditioned stimulus was an air puff and the conditioned stimulus a tone. The conditioned and unconditioned eyeblinks were

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detected photoelectrically (FRANKS and WITHERS, 1955) and registered by means of a recording milliammeter. All stimuli and physical conditions were standardized and controlled electronically. A partial reinforcement sequence was used, in which, during the acquisition part of the experiment, 18 acquisition test trials were interspersed among 30 reinforced trials. This was followed immediately by the extinction part of the experiment, which consisted of 10 successive trials with the conditioned stimulus alone. The irregular inter-trial interval was approximately 25 sec and, as always, the conditioning proper was preceded by brief tests for pseudo-conditioning and initial eyelid sensitivity to sound.

RESULTS

Table 1 summarizes the findings with respect to the Maudsley Personality Inventory (MPI). None of the groups differ significantly on introversion–extraversion,

TABLE 1.—MEAN MAUDSLEY PERSONALITY INVENTORY SCORES ON NEUROTICISM (N) AND INTROVERSION-EXTRAVERSION (E)

Group	*N*		*E*	
	Mean	S.D.	Mean	S.D.
A. In-patient neurotics	17·8	6·6	12·8	7·6
B. Out-patient neurotics	14·9	7·1	11·8	7·0
C. Asthmatics	14·2	8·3	12·0	7·9
D. Normals	12·1	5·8	13·9	5·3

Note (i). Scoring system used here was: 1 point to the designated scale for a keyed response; $\frac{1}{2}$ point for a "?" response. Thus here the possible range of scores on either *N* or *E* scales is from 0 to 24.
Note (ii). There were 20 subjects in each group. The only significant differences were between *A* and *D* for the *N* scale; $t = 3{\cdot}1$, $p < 0{\cdot}005$.

TABLE 2.—MEAN ACQUISITION AND EXTINCTION CONDITIONED EYEBLINK SCORES FOR EACH GROUP
(n = 20 per group)

Group	Acquisition		Extinction	
	Mean	S.D.	Mean	S.D.
A. In-patient neurotics	9·0	7·5	3·9	3·0
B. Out-patient neurotics	8·2	6·5	3·6	2·1
C. Asthmatics	9·1	7·4	3·4	2·5
D. Normals	8·7	6·6	3·6	2·5

nor are any trends apparent. The only significant difference on the neuroticism scale is between the mean scores of the in-patient neurotic group and the normals. There is, however, a marked tendency for the asthmatics to occupy a position intermediate between neurotic patients and normals on the *N* scale of the MPI. Thus the general impression that asthmatics present a mildly neurotic personality is confirmed, but it is quite impossible to conclude that they tend to be largely introverted neurotics (dysthymics) or that they tend to be extraverted neurotics (hysterics and psychopaths) It is impossible to differentiate the asthmatics from the other groups with respect to introversion–extraversion.

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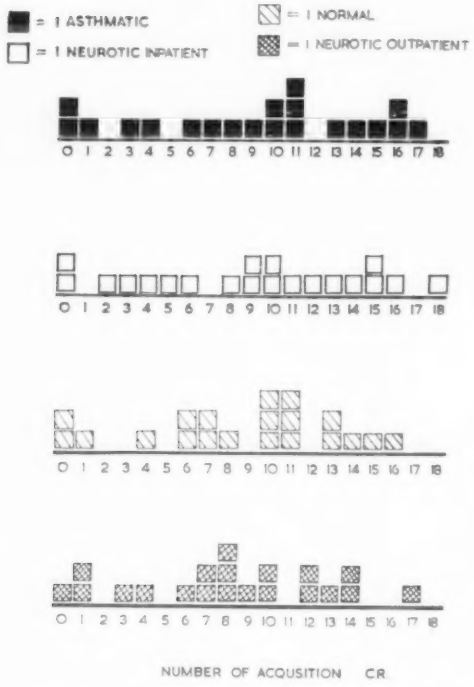
= 1 ASTHMATIC
= 1 NEUROTIC INPATIENT
= 1 NORMAL
= 1 NEUROTIC OUTPATIENT
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
NUMBER OF ACQUISITION CR.

FIG. 1.—Histogram of conditioned eyeblink responses during acquisition.

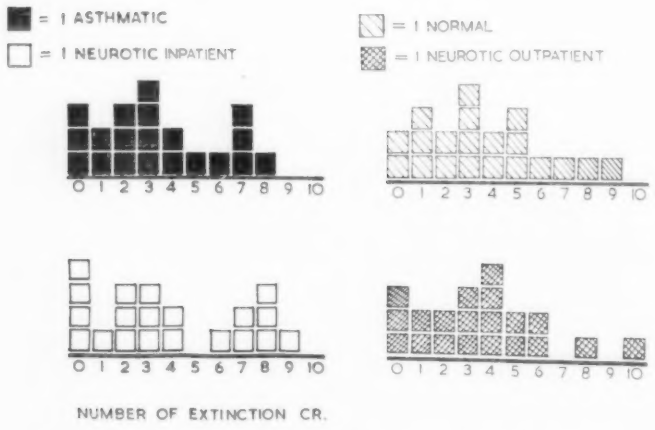

FIG. 2.—Histogram of conditioned eyeblink responses during extinction.

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This last conclusion is confirmed when Table 2 is examined. The mean conditioned eyelid response frequency scores for the four groups are apparently very similar and there are neither significant differences in conditioning nor trends. From the histograms (Figs. 1 and 2) it is clear that the conditioned eyelid response patterns of the four groups are indistinguishable. The sample of asthmatics studied here are no different from the normal and the two neurotic groups as far as introversion–extraversion and eyelid conditioning are concerned.

TABLE 3.—PEARSON PRODUCT-MOMENT CORRELATIONS BETWEEN CONDITIONING AND PERSONALITY MEASURES
($\eta = 80$)

	Acquisition	Extinction
Extraversion (E)	−0·26	−0·20
Neuroticism (N)	0·08	0·10

Since none of the groups differed significantly on any of the measures, with the exception of groups "A" and "D", who differed significantly on one measure, namely neuroticism, they were combined and the two sets of two personality and two conditioning scores correlated with each other (Table 3). As predicted, the correlations between neuroticism (N) and the conditioning scores are insignificant and almost zero. However, the predicted significant negative correlations between extraversion (E) and conditioning were not obtained. The two correlations are, however, negative and consistently larger than the corresponding correlations obtaining between the neuroticism and conditioning measures.

DISCUSSION

The present findings provide further support for a belief already expressed by LEIGH elsewhere (1956), namely, that there is no specific asthmatic personality apart from a common core of neuroticism which may be reactive to the dysfunction itself.

There are many possible reasons for the lack of significant relationship between extraversion and conditioning. First, almost all patients were on some form of sedative and a spray such as adrenalin or atropine, all of which are known to modify conditioning. However, none of these were given in the hours immediately prior to the conditioning and so their effects must be regarded as minimal, especially since the effects of sedatives and atropine are, as far as eyelid conditioning is concerned, probably partially antagonistic. Second, only one measure of extraversion was used, the MPI. It has been suggested, in a study carried out subsequent to the present one (SIGAL *et al.*, 1958), that the MPI may be of limited value in differentiating dysthymics from hysterics or introverts from extraverts. In the earlier studies, in which significant conclusions were obtained, Guilford's R scale was used as the measure of extraversion. Despite a very high correlation between the E scale of the MPI and Guilford's R scale, these two scales may, in fact, be different in other respects which are relevant

to eyelid conditioning and personality. Since the obtained extraversion conditioning correlations are negative and consistently large compared with the neuroticism-correlations, it seems more probable that the defect of the *E* scale is trivial and the small size of the correlations an artefact, possibly of the combined data.

In the absence of satisfactory evidence in favour of a general factor of conditioning it is premature to assume, because the sample of asthmatics studied here is no different to other groups in the ability to form and extinguish eyelid conditioned responses, that therefore these asthmatics would be equally undistinguished in their ability to form and extinguish conditioned asthmatic or other respiratory responses. Further direct investigations of this problem are necessary and also of the predictive relationship between conditioned asthmatic responses and other laboratory responses, including eyelid conditioning. If, as PEARSON (1958) suggests, asthma is not a disease entity but a syndrome, possibly learned, then future research must proceed along the following lines. First, establishing predictive laboratory conditioning techniques for the selection of suitable asthmatic candidates for conditioned response therapy (the success of this procedure does not depend on the existence of a *general* factor of conditioning). Second, an investigation of the technique of such therapy; at the simplest level this would consist of either separating the patient from the physical or psychic conditioning stimuli (as, for example, sending children to boarding schools) or maintaining the patient in the immediate vicinity of the noxious stimuli and extinguishing it in accordance with learning theory and conditioning principles. Third, an area which follows directly from the preceding problem, investigating the question of need reduction in relation to the asthmatic symptom. Most learning theorists now agree that the simple Aristotelian notion of association by contiguity is inadequate to account for all the phenomena associated with so-called classical conditioning and it is almost certainly necessary to evoke some theory of need or drive reduction (FRANKS, 1958b). Precisely what need or drive the asthmatic, or indeed any allergic, response reduces is a matter for future extensive research. Even then, since there is probably a multiplicity of causal factors, including heredity, only a partial answer will have been found.

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SUMMARY

Some research workers believe that asthmatics tend basically to be introverts; others believe that asthmatics tend to be extraverts. These beliefs were investigated in terms of an experimentally supported theory which relates ease of conditionability to the personality dimension of introversion–extraversion. When asthmatics, neurotics and normal subjects were compared on questionnaire measures of introversion–extraversion and on laboratory tests of eyelid conditioning, none of the groups were found to differ on either of these measures. The only trend apparent was for the asthmatics to occupy an intermediate position between the normal subjects and the neurotic patients on the neuroticism scale of the personality questionnaires. These findings provide further support for the belief that there is no specific asthmatic personality apart from a common core of neuroticism which may be reactive to the dysfunction itself. Although asthma can apparently occur in patients with any kind of personality, it seems probable, from the literature, that some attacks of this disorder may be understood and treated in terms of a learning theory and conditioning model.

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CHANGES IN TISSUE VULNERABILITY INDUCED DURING HYPNOTIC SUGGESTION*†

L. F. CHAPMAN, Ph.D., HELEN GOODELL, B.S. and H. G. WOLFF, M.D.

GRAHAM (1950) studying patients with urticaria about 10 years ago in the laboratories of the New York Hospital, showed that the tone of the minute vessels in the skin was reduced and permeability increased in situations perceived as threatening or during the discussion of them. Under these circumstances heretofore non-noxious stimuli, both mechanical and chemical, became capable of inducing flush, itching and urticaria and in some instances these latter phenomena occurred spontaneously.

Although careful descriptions of methods and results are rare, it has long been alleged that lesions in the skin could be induced by suggestion during hypnosis. A recent and well documented instance is that of ULLMAN who induced erythema with blister formation that was noted at the end of an hour, and was fully developed approximately 4 hr later (ULLMAN, 1947).

In this laboratory also it has been possible in experiments during hypnosis to demonstrate the occurrence of erythema and whealing in response to repeated suggestions that a warm rod applied to the skin was hot and would burn the skin (CHAPMAN *et al.*, 1959a). This observation was further evidence that activities at the highest integrative levels of the nervous system could modify the magnitude of inflammatory reactions in the periphery. In the studies reported in this communication experiments were designed to demonstrate that the degree of inflammatory response and tissue damage to a standard noxious stimulation could be augmented or diminished by activity of the central nervous system integrated at the highest levels. As an aid in manipulating these activities by the suggestion of relevant symbols the hypnotic state was induced. It was, however, recognized that the hypnotic state, *per se*, is not essential to the effects associated with suggestion, symbols and memories.

METHOD

Thirteen adult men and women served as subjects. Three of these were patients who had spontaneously occurring urticaria. The remainder were healthy and free of skin disorders.

Experiments were conducted in a quiet, semi-darkened, comfortably cool room. Thermocouples were attached to the subject's arms and a series of control temperatures recorded by means of a multichannel recording instrument. Finger cuffs for recording of the plethysmograms, were attached to the middle finger of each hand and control recordings made.

The subjects were hypnotized in the conventional manner. As soon as a state of moderate to deep hypnosis had been established it was suggested that one arm was either 'normal', or that it was 'numb', 'wooden' and devoid of sensation ('anaesthetic'). It was then suggested that the other arm was painful, burning, damaged and exceedingly sensitive, i.e., 'vulnerable'. Furthermore, it was suggested

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that severe injury to this 'vulnerable' arm which would cause even greater pain and damage was about to occur. The 'vulnerable' arm was then exposed on three spots blackened with India ink, to standard noxious stimulation (500 mcal-cm^2-sec for 3 sec). After an interval of 15–30 min during which hypnosis was continued, suggestions that the other arm was either 'anaesthetic', or 'normal' were repeated and reinforced. It was then similarly exposed on three spots to the standard noxious stimulation. In some experiments the order of exposing the 'vulnerable' or 'anaesthetic' arm to noxious stimulation was reversed. Also, the right arm was suggested to be 'vulnerable' in some experiments, the left in others. In some experiments the suggestion of 'vulnerability' for one arm and 'anaesthesia' for the other were made simultaneously and the noxious stimulation was applied during the same interval alternately on the two arms.

The inflammatory reaction and tissue damage were assessed by observations and measurements of area, intensity and duration of erythema, oedema, blister formation, necrosis and when present, of residual scar formation. Coloured photographs were made approximately 20 min after the end of an experiment, and at 24 hr intervals for about 2 weeks.

In one subject the subcutaneous spaces in the zones of axon reflex flares induced by the noxious stimulation were perfused. The method of perfusing the subcutaneous space is a modification of that of FOX and HILTON (1958) and for obtaining fluid inflow and outflow perforate needles were used. These needles were #20 steel hypodermic needles with eight perforations in the shafts.* The needles were inserted into the subcutaneous space of the volar surface of the forearm parallel to each other and approximately 1·5 cm apart. The rate of inflow of the perfusion fluid (physiological saline) was 0·5 ml/min. Six minute samples of the perfusate were collected throughout the experiment during 30–60 min thereafter. The perfusate was collected in siliconized tubes and was immediately assayed or frozen in solid CO_2 to prevent alteration and then subsequently assayed when convenient. The perfusates were assayed by the conventional smooth muscle (rat uterus and duodenum) methods. After the desired suggestions of 'vulnerability' in one arm and 'anaesthesia' in the other were made, the skin of the two arms was injured by standard noxious thermal stimuli at a distance of approximately 4 cm on either side of the collection site. Aliquots (0·2 ml) of the samples of perfusate were added to the chamber containing the muscle strip and the amplitude of contractions induced expressed as the amount of bradykinin standard required to induce similar contractions.

RESULTS

The thirteen subjects were hypnotized in 40 experiments. During 12 of these, increased pain and damage were suggested in one arm, and on the opposite side suggestions that the arm was normally sensitive were made. The inflammatory reaction and tissue damage was greater on the side of suggested 'vulnerability' in 9 of this series of 12 experiments; in 1 increased damage was observed on the side of suggested normal sensitivity and in 2 no difference was noted. In 27 experiments it was suggested that one arm was 'vulnerable' and that the other arm was 'anaesthetic'. In 1 experiment greater damage occurred in the arm of suggested 'anaesthesia'. In 6 no difference was observed in the two arms. However, in 20 of this series of 27 experiments the inflammatory reaction was greater on the side of suggested pain and damage. In 1 experiment it was suggested that one arm was anaesthetic, the other normally sensitive. The reaction was far greater on the normal side. Although the

* The perforated needles were specially made by Becton Dickinson Co.

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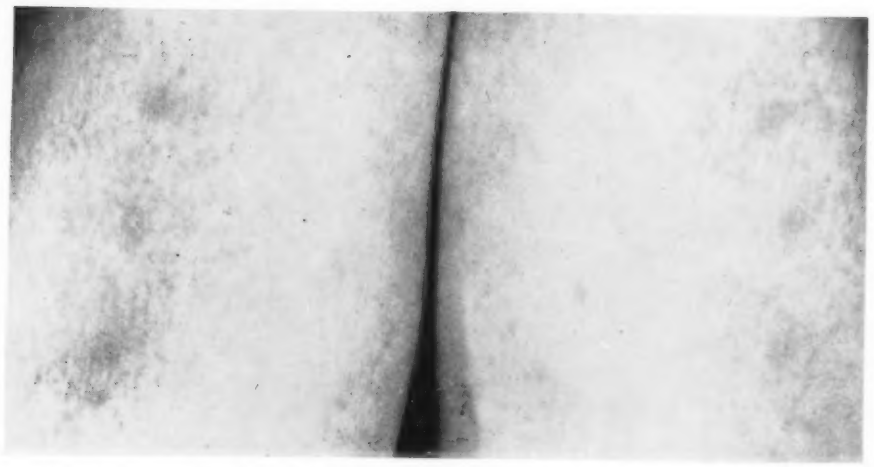

FIG. 1.—Photograph of the arms of subject L. O. made approximately ½ hr after noxious thermal stimulation during hypnosis. The right arm was suggested to be 'vulnerable', the left arm 'anaesthetic'. The burns were made in quick alternation from one arm to the other within a period of 30 sec. Note the more extensive erythematous reaction surrounding the burns on the 'vulnerable' arm (right).

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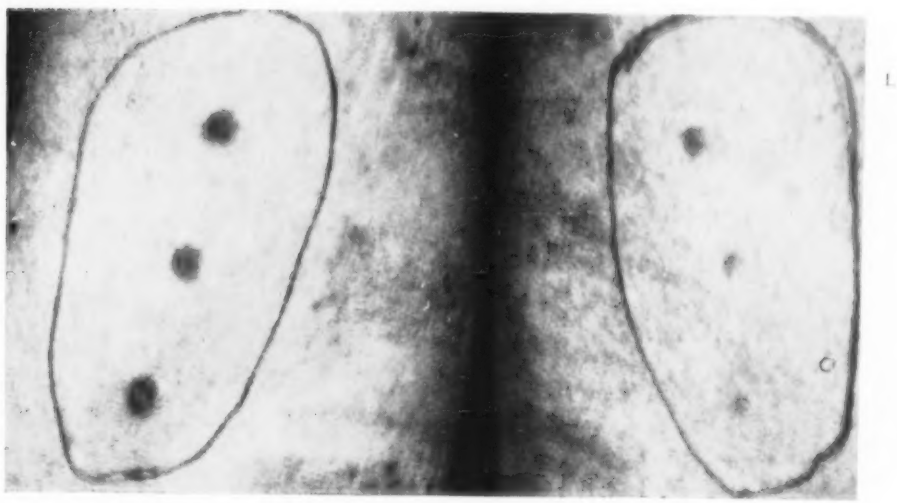

FIG. 2.—The arms of subject L. O. photographed 4 days later than the photographs of Fig. 1. Note the greater tissue damage on the 'vulnerable' right arm, as compared with that on the 'anaesthetic' left arm, resulting from identical intensities and durations of noxious thermal stimulation.

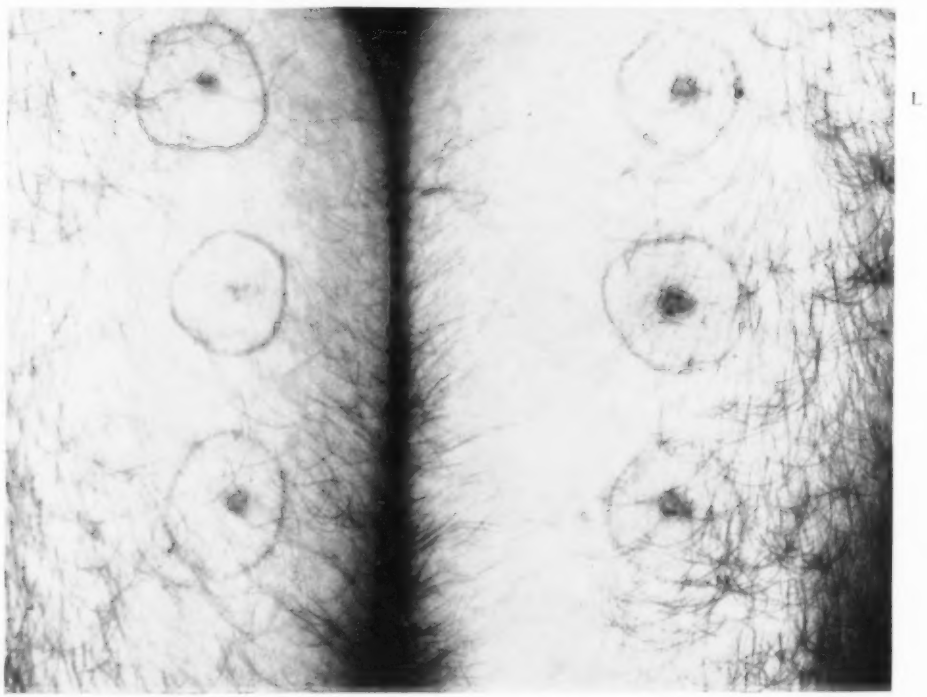

FIG. 3.—Photograph of the arms of subject S. H. made 3 days after noxious thermal stimulation during hypnosis. The burns were made in quick alternation from one arm to the other while the left was being suggested as 'vulnerable', the right arm as 'anaesthetic'.

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contrast was greatest in the magnitude of reaction between suggested 'anaesthesia' and suggested 'vulnerability', it was also evident that the effect of suggested 'anaesthesia' was to suppress the inflammatory reaction as contrasted with no suggestion or suggestion of normality.

In Figs. 1–3 are shown the greater damage in the vulnerable arms, and the lesser damage in the 'anaesthetic' arms after identical thermal stimulation of the two limbs. One patient who complained of spontaneously occurring urticaria developed urticarial

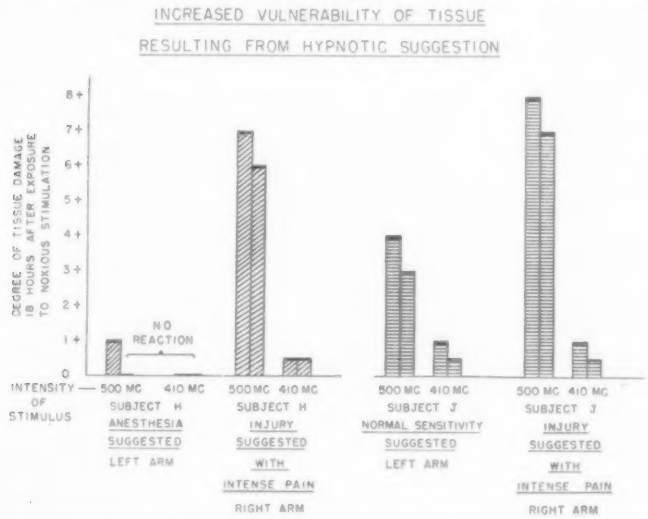

FIG. 4.—Diagramatic representation of increased vulnerability of tissue induced during hypnotic suggestion in two subjects, 'H' and 'J'. Two intensities of thermal stimulation were used, and the effects of suggested anaesthesia compared with those of 'vulnerability' in subject 'H'; and the effects of suggested normal sensitivity compared with those of 'vulnerability' in subject 'J'.

reactions in other parts of her 'vulnerable' arm following noxious stimulation by heat (500 mcal-cm^{-2}-sec^{-1} for 3 sec). Urticaria was not observed on the 'anaesthetic' arm at this time.

In two experiments in two subjects two exposures of 500 mcal and two exposures of 410 mcal were made on each arm. The less intense stimulation was used in order to ascertain whether the effects of highest level functions would be more conspicuous when the damaging stimulus was less intense. It was shown that when anaesthesia was suggested in the one subject no visible damage could be perceived 18 hr after the stimulation with 410 mcal, whereas when injury with intense pain was suggested this less intense stimulus produced a readily detectable lesion.

In the second subject the difference in reaction between the arm with normal sensitivity and the one with suggested injury and intense pain was less striking but the inflammatory response to the more intense stimulation was conspicuous (see Fig. 4), on the side of suggested 'vulnerability'.

Experiments designed to ascertain the nature of the relevant tissue responses that could explain the greater amount of damage in the 'vulnerable' arms were then carried out. The two arms were prepared for measurement of skin temperature, for finger plethysmographic recordings and for the collection of perfusate. These

observations were made before and during the period of hypnosis, both before and after the application of noxious stimuli. No significant differences in the amplitude of finger pulsations, in the skin temperature of the arms, or in the bradykinin content as measured in the perfusates could be observed between the 'anaesthetic' and the 'vulnerable' arms before the damaging stimulus was applied, although other experiments in this laboratory indicate that such differences may be induced during suggestion alone. Under the given experimental circumstances reported here, in response

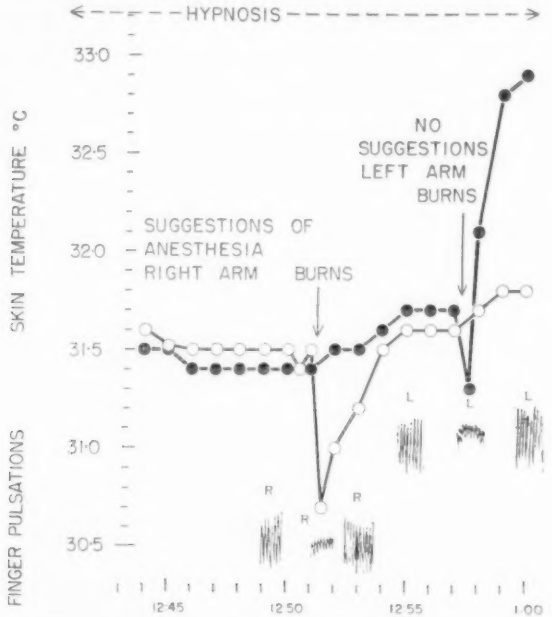

FIG. 5.—Measurements during hypnosis of the skin temperature and amplitude of finger pulsations of the right 'anaesthetic' arm and of the left arm stated to be normally sensitive. Note the larger initial vasoconstriction as indicated by fall in skin temperature in the arm suggested to be anaesthetic (right), and the markedly reduced subsequent vasodilatation as compared to the reaction to the burns on the normally sensitive side (left). The absence of, or the minimal vasodilatation after injury in the arm suggested to be 'anaesthetic' affords a partial explanation of the minimal effect of injury.

to noxious stimulation there was a greater and longer sustained rise in the skin temperature of the 'vulnerable' arm (Figs. 5 and 6) as well as a greater increase of bradykinin content in the perfusate from this arm (Fig. 7) as compared with the 'anaesthetic' arm. The greater rise in skin temperature occurred in all experiments in which damage was greater on the 'vulnerable' arm. A corresponding increase in finger pulsations was frequently seen, but was less predictable.

COMMENT

Experiments with immersion in hot water, (BILISOLY *et al.*, 1954) implicating the thermoregulatory centres in the brain stem and hypothalamus and experiments with hypnosis, implicating the highest levels of neural integration, demonstrated that activity within the central nervous system at several levels can augment the effects of the axon reflex (CHAPMAN *et al.*, 1959b). The occurrence of spontaneous urticaria

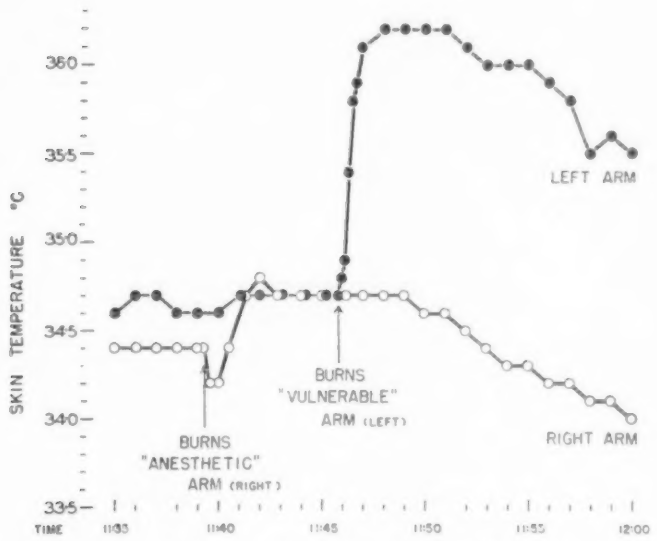

FIG. 6.—Measurements during hypnosis of the skin temperature of the right ('anaesthetic') and the left ('vulnerable') arm previous to, during, and following the application of a damaging heat stimulus (500 mcal-cm^{-2}-sec^{-1} for 3 sec). The right arm was suggested to be numb, anaesthetic and without feeling, whereas the left arm was suggested to be already damaged, painful and about to be injured further. Note the greater degree and more persistent rise of skin temperature after suggestion of damage, indicating the pertinence of vasodilatation to the enhanced inflammatory reaction to injury.

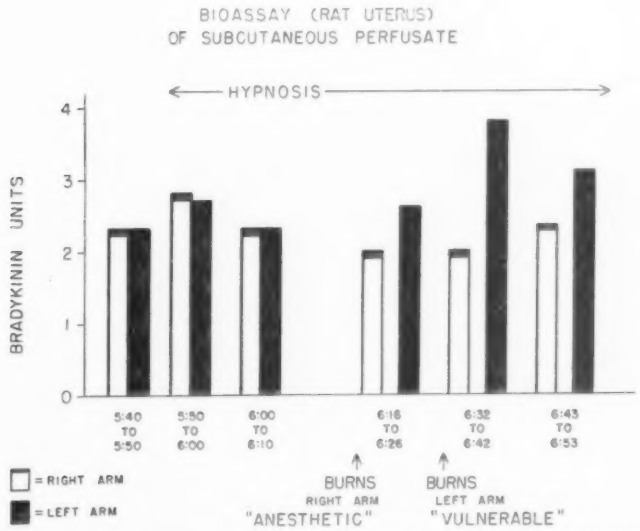

FIG. 7.—Bioassay of the subcutaneous perfusate expressed as units of a standard preparation of bradykinin inducing equivalent contractions of the rat uterus. After injury of the 'vulnerable' arm during hypnosis there was more bradykinin activity in the perfusate from the flare zones induced by the thermal injury than in the perfusate from the arm suggested to be 'anaesthetic'.

observed in one susceptible subject in this study suggests a widespread heightened reactivity in the vulnerable arm during the threatening situation created by suggestion and by burns.

It thus appears that the individual's perceptions and attitudes are relevant to neural activities that engender or enhance inflammatory reactions. The liberation or accumulation of proteolytic enzymes in the periphery and the subsequent formation of a bradykinin-like humoral agent is implicated in these heightened reactions.

Enhanced inflammation has been shown to be effective in combating invasion by micro-organisms and in the rapid elimination of tissue breakdown products of injury. Therefore, the present alternations indicate that man includes among his adaptive and protective devices, neural reactions integrated at the highest levels that heighten inflammation in the peripheral tissues and increase the local susceptibility to injury—thus enhancing the protection of the whole organism at the cost of the integrity of a part. Such adaptive reactions at times may be essential to survival, but if evoked inappropriately or excessively may contribute to disease since non-noxious stimulation becomes noxious and mildly damaging stimuli result in greater injury. On the other hand, the observations reported here clearly suggest that activity of the highest integrative functions may also prevent excessive or inappropriate response and initiate appropriate tissue reactions.

SUMMARY AND CONCLUSIONS

(1) Following standard amounts of noxious stimulation on the forearm during hypnosis, decreased inflammatory reaction and tissue damage was observed when the suggestion was made that the arm was insensitive and numb and would not be hurt, 'anaesthetic', as compared to the reaction and tissue damage of the other arm which was suggested to be normally sensitive.

(2) Following standard amounts of noxious stimulation on the forearm during hypnosis, increased inflammatory reaction and tissue damage was observed in subjects who had received the suggestion that the forearm was tender, painful and injured ('vulnerable') as compared with arms suggested to be normally sensitive or 'anaesthetic'. Recordings of finger pulse amplitude and skin temperature indicated that local vasodilatation following exposure to noxious stimulation was larger in magnitude, and persisted longer in the 'vulnerable' arm. The subcutaneous perfusate from the arm suggested to be painful, tender and damaged developed a greater increase of a pharmodynamic substance in response to standard noxious stimulation than did that from the arm suggested to be 'anaesthetic'.

(3) This pharmocodynamically active substance induced itching, local vasodilatation and oedema, lowered blood pressure, lowered pain threshold, induced delayed and slow contraction of the rat uterus and guinea pig ileum and resulted in relaxation of the rat duodenum. It deteriorated at room temperatures, was stabilized by boiling and destroyed by chymotrypsin. It was not acetylcholine, histamine or serotonin, although these and other relevant agents may also have been present. It had many of the properties of a polypeptide of the bradykinin type.

(4) Neural activity involving the segmental or axon levels, the brain stem and hypothalamic levels, as well as the subcortical and cortical levels can alter the reactions in the peripheral tissues subserved in such a way as to augment inflammation and increase local tissue damage in reaction to noxious stimulation. Proteolytic enzymes and a bradykinin-like polypeptide is implicated in these enhanced reactions.

Acknowledgement—The writers gratefully acknowledge the advice and assistance of MCKEEN CATTELL, Ph.D., M.D., Professor of Clinical Pharmacology, Cornell University Medical College.

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THE SERIAL STUDY OF ADRENAL STEROID EXCRETION*

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THIS laboratory has for some time been engaged in the study of endocrine function in various psychiatric disorders and in particular in seeking evidence of changes in the activity of the glands concerned during the course of these illnesses. It is the purpose of this paper to discuss some of the problems involved in such serial investigations including the suitability of various methods of steroid estimation. In so doing a reference paper is provided for the procedures used in a number of studies made in collaboration (GIBSON and WILLCOX, 1957; and others to be published).

Such serial investigations or longitudinal studies have not been widely used but offer an unique approach to certain psychosomatic problems and attempts to correlate psychiatric and biochemical findings. Indeed they may properly be considered as an extension by means of biochemical and endocrine techniques of the traditional method of the study of the natural history of disorders, a method which has been fruitful in general medicine for understanding not only the course of the disorder but also the effect of therapeutic interference at different stages.

On the other hand such studies have been criticized for the difficulty in applying statistical methods to the results, and for the lack of quantitative precision in the psychiatric findings with which the laboratory results are correlated. Time series do, however, to some extent provide their own controls, and a graphical and descriptive treatment of the data can be most revealing. It is the more important in these circumstances to ensure that hazards in the collection and storage of biological materials are minimized, that the reproducibility of the methods of assay is known with special precautions against minor variations from batch to batch of estimations, and that the significance to be attached to the results is clarified as far as possible. These problems will be considered in the light of several years work during which some thousands of steroid estimations have been made.

So far as the adrenal cortex is concerned the following general assumptions have been made.

(1) That changes in the activity of the cortex occurring over periods of days to weeks are likely to be revealed most satisfactorily by changes in the urinary excretion of adrenal steroids.
(2) That the excretion figures would be an indication of the activity of the cortex or of a particular function of the cortex.
(3) That measures of urinary excretion of adrenal steroids should therefore include and so far as possible separate androgen and corticoid groups.
(4) That the excretion of these substances should be assessed throughout the period of clinical observation by frequent regular assays, usually on successive 24 or 48 hr pools.

Previous experience with various methods of 17-keto-steroid estimation and with TALBOT's (TALBOT *et al.*, 1945) method for 11-oxy-corticosteroids had impressed the

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need for shorter methods if the number of assays involved in the study of even a few patients could be undertaken. The method of TOMPSETT (1953) originally described as for corticosterone-like substances and later (TOMPSETT and SMITH, 1954) as for acid stable formaldehydogenic substances (ASFS) had the considerable advantage of a common hydrolysis and extraction procedure for both 17-ketosteroid (17KS) and corticoid estimations. The method proved relatively rapid and of good reproducibility, and has been used extensively in spite of some initial doubt of the nature of the substances measured.

During the period of collection of these data methods of estimation of corticoid metabolites as 17-ketogenic steroids (17KGS) have come into fairly general use in laboratories undertaking regular steroid estimations. A comparison has therefore been made between estimations of 17KGS and ASFS with the object of seeing whether any differences exist in the excretion patterns of a time series for an individual obtained by these technically different methods.

Collection of specimens

The hazards of collection of 24 hr specimens of urine are well known. The principal source of error is probably the presentation of a sample of urine, mainly night urine or early morning urine, and the assumption that it is representative of the 24 hr excretion. Although many psychiatric patients are most satisfactory collectors the problem may be considerable with some disturbed patients. The observations of the nursing staff can be most helpful in knowing whether an incomplete collection is reasonably representative of the 24 hr. If satisfied that this is so the assay may be worth while, and a creatinine correction can be applied to the result. This point has been carefully considered because the difficulties of collection tend to increase at the times of most potential interest as a patient is becoming more disturbed, and therefore all possible information is collected at these times even though some of it must later be discarded as unreliable.

Storage

Urine specimens are stored without preservative in the refrigerator at 4°C as soon as they are received from the wards. Weekly extractions and estimations of 17KS and ASFS on urines stored under these conditions have shown no significant change over periods of from 4 to 6 weeks.

METHODS

The following methods have been used in these investigations.

(1) 17-Ketosteroids. The MRC recommended method (1951). This has been modified only by the use of chloroform as extracting solvent to allow a common hydrolysis and extraction procedure for both 17KS and ASFS. The change of solvent from the carbon tetrachloride given in the method was not found to produce any significant alteration in values.

(2) Corticoids have been measured as the acid stable formaldehydogenic substances. The method was described by Tompsett in 1953 and given the present name subsequently (TOMPSETT and SMITH, 1954).

(3) Creatinine. The method of FOLIN.

(4) 17-Ketogenic steroids. The method of NORYMBERSKI *et al.* (1953) was first used, and later the modified methods of MOXHAM and NABARRO (1956).

(5) Urinary sodium and potassium were measured by the flame photometer.

Estimations

Estimations are carried out in weekly batches. A series of standards of graded values are preferred to a single or duplicate standard of one value. In addition one urine is carried over from each of the last two batches as an additional check that there is no variation in estimation from batch to batch.

Error of methods

As a result of the procedure just described a series of repeated estimations on different urines each assayed in two different batches is obtained. From this a standard deviation is calculated which is based on figures spread regularly throughout the period

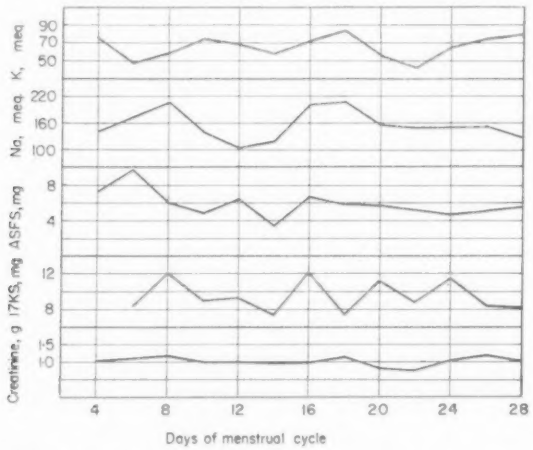

FIG. 1.—Creatinine 17KS ASFS Na and K excretion; time series; normal female subject; estimations on 48 hr pools; mean 24 hr values plotted.

of collection of data. This is considered to give a more realistic view of the variation involved in these estimations than figures especially collected for this purpose within a short space of time.

Thus the standard deviation of the differences in a series of thirty-four urines each estimated on two separate occasions was 0·68 mg per 24 hr for 17KS, and the corresponding figure for ASFS based on twenty-six specimens was 0·77 mg per 24 hr. Similar calculations for creatinine show a standard deviation of 0·06 g per 24 hr, and for urinary sodium and potassium 2·5 mEq per 24 hr and 1·8 mEq per 24 hr, respectively.

Variations in a normal subject

Fig. 1 shows the results of serial 48 hr estimations of creatinine, 17KS, ASFS, sodium and potassium throughout one intermenstrual period in a young normal female subject. It will be seen that the creatinine excretion is fairly steady around the 1·0 g level. 17KS vary from 7·0 to 12·0 mg per 24 hr, but the variation appears random throughout the period of observation. The ASFS show variation from 3·4 to 6·5 for the greater part of the time. The first two observations (7·2 and 9·8 mg per 24 hr) were made during a period of 4 or 5 days when the normal domestic life of this

subject, usually of rather placid temperament, was disturbed by restless nights and some anxiety occasioned by a teething child. The remainder of the time was uneventful by the subject's own assessment.

The sodium and potassium excretion both show moderate fluctuations, and these may be taken to represent the variations attributable to a normal mixed diet. It is possible, however, that the depression of sodium excretion seen between the eighth and the fourteenth days might be influenced by the rising oestrogen activity to be expected at that time. With this possible exception the variations in excretion of the substances assayed do not show any characteristic pattern nor any special relationship to the menstrual cycle.

Creatinine correction

The relative constancy of creatinine excretion for an individual has been seen in many series covering periods of weeks to months. Daily variations of up to 20 per cent may occur but are often much less and are of random distribution. Table 1 shows figures for a number of individual series on psychiatric patients. Reasons for the higher range of variation in the first patient are given below.

TABLE 1.—VARIATION IN 24 HR EXCRETION OF CREATININE

Patient	1	2	3	4	5
Sex	F	M	M	F	M
Period of observation (months)	5	1	3	1	1
Range	0·9–1·8	1·3–1·9	1·1–1·8	0·7–1·0	1·6–2·1
Mean	1·3	1·6	1·4	0·8	1·8
S.D.	0·2	0·16	0·17	0·09	0·15
2 × S.D. as % of mean	31	20	24	20	17

All values in g per 24 hr.

The validity of correcting steroid or other excretion values to an arbitrary amount of creatinine or to the calculated normal creatinine for the individual has been considered. This is only done when a series contained more than occasional incomplete collections. Limits for accepting such incomplete saves as representative of the 24 hr have been mentioned above. Two further points are important. First the purely arithmetical error in correcting one value in terms of another when both are subject to variation inherent in the methods. Table 2 illustrates the gross variation which may be introduced in this way, but also indicates limits to ensure that such errors do not exceed 2 mg per 24 hr. Secondly there are grounds for believing that if the creatinine excretion in man is affected by pituitary or adrenocortical activity there is a direct relationship. This would imply that if fluctuations of steroid output are demonstrated using creatinine corrected figures they are minimal fluctuations and that estimation of complete saves or knowledge of the true creatinine figures would have demonstrated greater fluctuations.

To test the validity of this view the actual values estimated in a series of saves from a known reliable collector have been plotted (Fig. 2) together with the same values 'corrected' per gramme creatinine. It can be seen that the general behaviour of the

TABLE 2.—MATHEMATICAL ERROR IN CORRECTION OF URINARY STEROID EXCRETION BY CREATININE CONTENT
(using creatinine estimations subject to maximal error of ±0·06 g)

Estimated 17KS content (mg)	Estimated creatinine (g)	Possible variation in corrected value (mg)
2	0·3	6–8
5		14–21
7		19–29
2	0·4	4·3–6·0
3		6·5–8·8
4		8·7–11·5
3	0·5	5·4–6·8
5		9·0–11·4
6	0·6	9–11·1
8	0·7	10·5–12·5
10	0·8	12·8–13·5
15	0·9	15·6–17·8

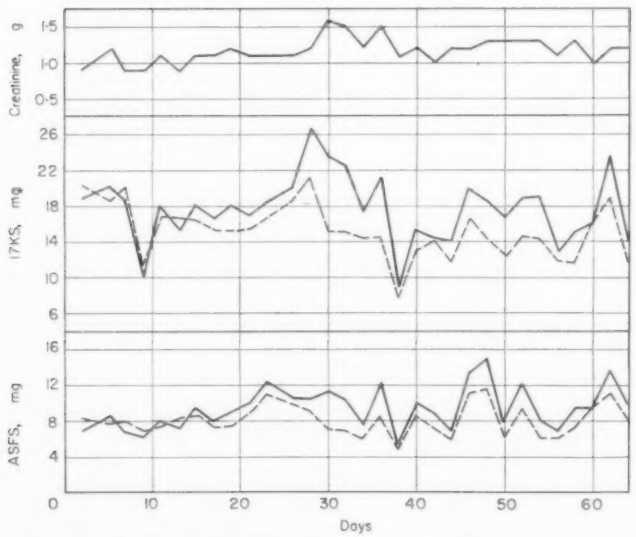

FIG. 2.—Creatinine and steroid excretion; time series; patient T; ——— estimated values; – – – – values per g creatinine.

curve is not altered although the fluctuations are less marked. The reason for this is clear since in this patient there is a definite rise in creatinine excretion following that shown by the 17KS. This accounts for the greater range of creatinine excretion by this patient (Patient 1, Table 1). On the other hand, in a patient known to be a poor collector, cyclical variations in sodium excretion have been demonstrated using creatinine corrected values, and parallel variations were seen in the sodium potassium ratio in the calculation of which no such correction was necessary.

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These facts and the precautions mentioned above give some confidence that useful data can be obtained in this way which might otherwise be lost owing to difficulties in collection.

The significance of the 17KS

Detailed discussion of this difficult question would be too lengthy in the present context, but a few relevant points must be considered here. The method has been widely used for many years as an index of adrenocortical activity and is generally accepted also as giving somewhat specific information of androgen activity. Its

TABLE 3.—STABILITY OF CORTICOID SIDE CHAINS TO HOT ACID HYDROLYSIS

1	2	3	4	5	6
CH_2OH	CH_2OH	CH_2OH	CH_2OH	CH_3	CH_3
CHOH	C=O	CHOH	C=O	CHOH	C=O
—CH	—CH	—COH	—COH	—COH	—COH
17-Desoxy compounds					
Corticosterone metabolites		Cortisone and hydrocortisone metabolites			
			P.S. chromogens	Pregnanetriol	
Acid stable		Acid stable	Partially acid stable	Acid labile	

ASFS includes 1, 2, 3 (90% recovery), 4 (40% recovery).
17-KGS includes 3, 4, 5, (6).

limitations as such an index are well known, and due to the fact that some ketosteroid substances are metabolites of glucocorticoid compounds, whereas those which are metabolites of androgens derive in man from two sources, the adrenal cortex and the interstitial cells of the testis. There is a striking lack of knowledge of the extent to which the testicular component may vary from day to day and of the factors which might influence such variation. Nevertheless this method remains the only practical one for use in this type of investigation. Its significance as an index of androgen activity may be clarified by comparison with the related corticoid excretion.

The significance of the ASFS

The estimation of ASFS has been used as a measure of adrenal corticoid excretion. The original belief that it was specific for corticosterone-like substances is no longer accepted, (TOMPSETT and SMITH, 1954; MARRIAN and ATHERDEN, 1953). Table 3 illustrates the main corticoid side chains known to occur in human urine, and indicates some of their properties and relationship to particular compounds and methods of estimation. Since the 17-desoxy compounds are acid stable, ASFS measurements will certainly include corticosterone and its metabolites if and when these are present.

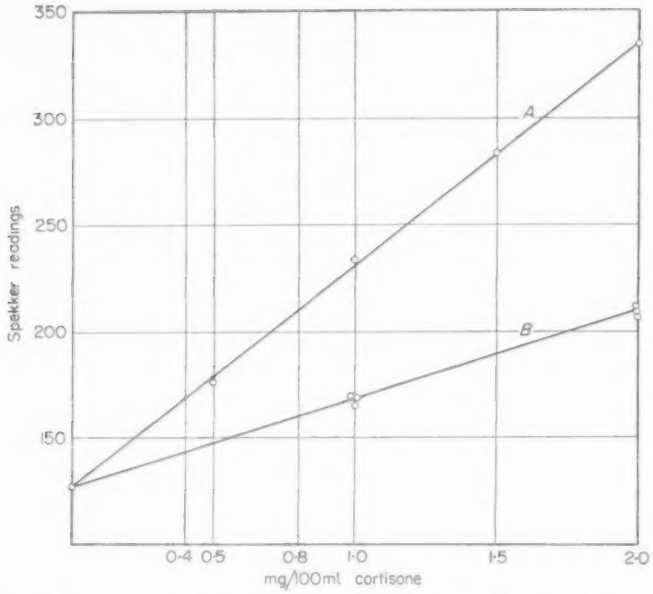

FIG. 3.—Recovery of cortisone in pure solution from hydrolysis and extraction procedure for ASFS.
(A) Untreated standards.
(B) Hydrolysed and extracted standards.

TABLE 4.—RECOVERY OF CORTISONE ADDED TO URINE AND ESTIMATED AS ASFS

Urine aliquots	Cortisone added	BH_1 treatment	ASFS values	Mean	% Recovery
1	nil	none	0·38		
2	nil	none	0·39	0·38	—
3	nil	none	0·36		
4	0·5	none	0·58		
5	0·5	none	0·55	0·55	34
6	0·5	none	0·53		
7	0·5	treated	0·84		
8	0·5	treated	0·78	0·81	86
9	0·5	treated	0·81		

All values as mg per 100 ml. Cortisone equivalents.

Current evidence is that in man corticosterone is present in both blood and urine in only small amount. It is therefore believed that the ASFS are normally cortisol, cortisone and their metabolites. On the assumption that at least 50 per cent of corticoid substances are cortisol, cortisone or their tetrahydro derivatives but that the trihydroxy side chain metabolites are present in excess of 30 per cent (FUKUSHIMA *et al.*, 1955), a rough calculation can be made (Table 5) suggesting that the acid stable fraction represents approximately 50 per cent of the total corticoid excretion.

Fig. 3 and Table 4 show the recovery figures on which these calculations are based.

TABLE 5.—ASFS AS % OF TOTAL CORTICOID EXCRETION

Of total corticoid excretion	ASFS
50% with CH_2OH | $C=O$ | $-C=OH$	35% recovery = 17% of total
40% with CH_2OH | $CHOH$ | $-COH$	86% recovery = 34% of total
Total 100%	ASFS 51%

TABLE 6.—VALUES FOR URINARY EXCRETION OF ASFS

	Range	Mean
Normal		
26 est. on 10 subjects.	3·4–10·9	6·8
(TOMPSETT: 14 subjects)	4·5–7·5	5·9

Response to ACTH		Before ACTH	After ACTH
Normal subjects	1	7·0	14·4
	2	6·2	17·5
	3	5·0	12·1
Schizophrenic patients	1	2·9	16·4
	2	3·2	11·8
	3	7·8	22·8
	4	8·3	30·8
	5	3·7	4·5
	6	9·4	9·2
Cushing's syndrome	1a	26·0	57·0
	b	31·5	65·0
	2a	31·5	
	b	34.2	

All values in mg per 24 hr.

Cortisone is partially destroyed by the hot acid hydrolysis but the recovery from a controlled procedure regulating acid concentration and time of hydrolysis is constant. The finding here fits well into the range of recoveries demonstrated by MARRIAN and ATHERDEN (1953) by varying these conditions. When, however, the trihydroxy side chain is formed by treatment with potassium borohydride recoveries averaging 86 per cent are obtained.

Table 6 shows the range of normal values for ASFS, the response to corticotrophin

(ACTH) in a few normal subjects, some varied responses in schizophrenic patients and high values in Cushing's syndrome.

Finally the results of ASFS estimations have been compared with the 17KGS values for the same specimens. This has been done in time series for three patients covering

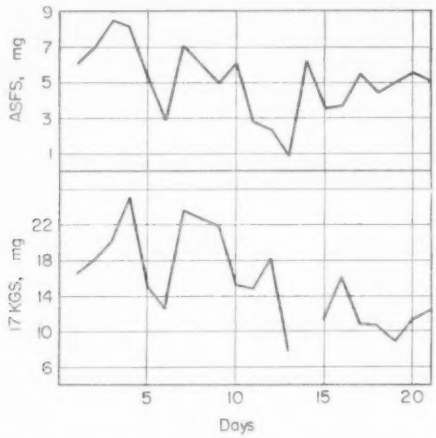

FIG. 4.—Twenty-four hour excretion of ASFS and 17KGS; time series; patient *B*.

periods of 21, 27 and 35 days (Figs. 4, 5 and 6). It can be seen from the graphs that the general behaviour of the curves is the same. There is one obvious anomaly (Fig. 6, day 6) probably due to a technical error, and unfortunately it was not possible to repeat this observation, but for the rest there is general agreement on the direction of change when this is significant in terms of the ASFS measurement. The ratio of the

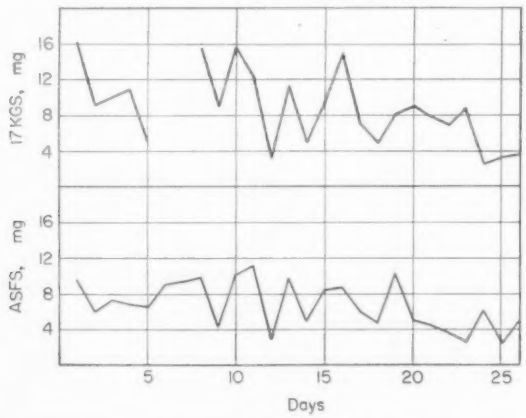

FIG. 5.—Twenty-four hour excretion of ASFS and 17KGS; time series; patient *A*.

actual amounts differs in different individuals, and is only approximately constant through a series for one individual. Thus the average ASFS 17KGS ratio for each of these series is 1 : 2·5, 1 : 1·5 and 1 : 2·3. More detailed comparison along these lines would be unprofitable since it must be remembered that the ASFS will include 17-desoxy compounds whereas the 17KGS will include some 21-desoxy compounds.

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While these normally are both small in amount, there is no information whether they vary in these series or between these patients and could thus contribute to variation in the ratios. Nevertheless the ratio figures are of the order of the approximate 1 : 2 ratio expected from the theoretical considerations and recoveries presented earlier. The important practical point, however, is that deductions regarding variation in adrenocortical activity would be the same whichever method is used. Agreement

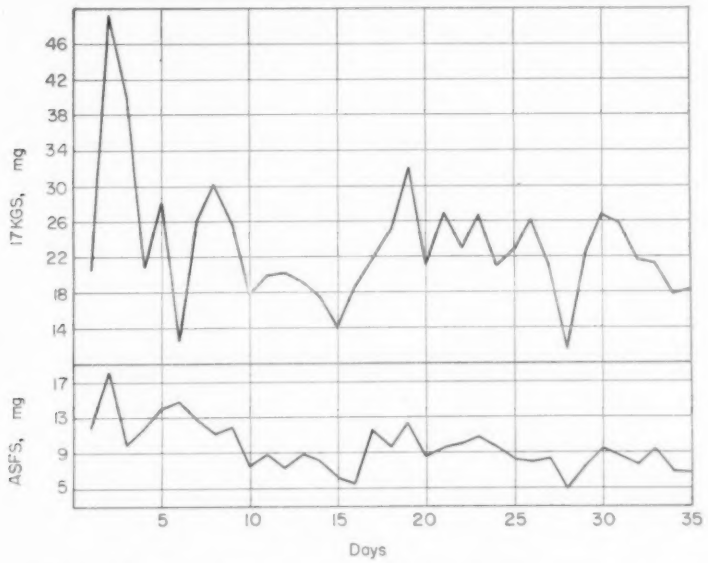

FIG. 6.—Twenty-four hour excretion of ASFS and 17KGS; time series; patient *H*.

between such chemically widely different methods can also be taken as evidence that there is no significant interference from non-steroidal substances in either method.

SUMMARY

(1) The use of serial investigations in the course of psychosomatic or psychiatric illness is discussed.

(2) Difficulties and necessary control measures are described and details given of the reproducibility of the methods relating to adrenocortical function.

(3) Findings in the serial study of a normal subject are given.

(4) The procedure of 'creatinine correction' has been investigated and is considered to be of value within certain limits.

(5) Experimental and clinical data on the estimation of ASFS are presented indicating that this is a satisfactory measure of gluco-corticoid excretion. Comparison through time series on three patients show agreement between this method and that for the estimation of corticoid excretion as 17KGS.

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THE MECHOLYL (FUNKENSTEIN) TEST: A NEW METHOD OF ASSESSMENT AND ITS USE IN MEASURING RELIABILITY

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INTRODUCTION

SINCE the test of autonomic function (response of blood pressure to injection of adrenaline and mecholyl) associated with the name of FUNKENSTEIN was first introduced (FUNKENSTEIN, GREENBLATT and SOLOMON, 1948), it has aroused steadily increasing interest. The number of papers published has grown continually, but despite a considerable amount of investigation, its value still remains in doubt. FUNKENSTEIN and his colleagues devised a method of classifying the graphs obtained from test results, and found that certain types of curve were related to a good response to electroshock treatment. Some workers have confirmed the original findings and others have not. Those who accept the predictive value of the test have proposed theories to account for this, in which the state of functional activity, or the type of reaction of the autonomic nervous system, is regarded as the important factor related to the outcome of treatment. It cannot be said that we have yet any adequate understanding of what the test measures, what relation this thing measured bears to outcome of treatment and why. It is unlikely that much progress will be made until some information is available on these questions.

On the assumption that the test is predictive above chance, then its low predictive power may be ascribed to three causes.

The first is that it can predict outcome in a particular type of disorder (or patient) only, and since this type is uncommon, then in any series of cases, it tends to be hidden by a mass of others not predicted. The second is that the test is correlated with a component of mental disorders which has a relatively small variance. This means that if we assume, not unreasonably, that there are many factors associated with response to treatment, then the test measures only one of them, and that not an important one. This is what is meant when the Funkenstein test is said to have low validity. The third cause is that the test has a low reliability, i.e. there is a large amount of 'error' involved in the test. It follows that the test cannot predict itself and clearly this sets an upper limit to its capacity to predict anything else. It is important to recognize that these three explanations of low predictive power are not mutually exclusive, although under certain circumstances, the first two can be.

Reliability

Of these three, the question of reliability takes precedence, since a test of low reliability can never have high validity. Before reviewing the work on the reliability of the test, it is worth considering the sources of unreliability. These also can be classified into three types. In the first place, the function measured may vary from time to time (function fluctuation); in the second, the measurement of the function may include much error; and finally, the categorization of the curves obtained may be unreliable.

Before these sources of unreliability can be considered, another point must be dealt with. The original work on the test claimed that its predictive power cut across diagnostic boundaries, and in view of the importance of this claim, it can only be said that insufficient attention has been paid

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to it. Since it is known that e.c.t. has only a temporary effect on patients suffering from schizophrenia, whereas it may permanently resolve a state of depression, the clinical evidence clearly implies fundamental differences between these two types of disorder in their response to e.c.t. Although it may be true that the Funkenstein test can predict response to treatment without regard to diagnosis, before such a claim can be accepted it must be very clearly proved. In fact, the necessary preliminary to this, the proof that it has any predictive power, is still in doubt. Therefore, until this point is settled, any work which ignores diagnostic boundaries is likely to be defective, unless remarkably high positive findings are obtained; and this has not occurred.

Reliability of categorization

It is remarkable that this problem has received so little attention. Favourable results were reported in a brief note by FUNKENSTEIN, *et al.* (1952), who mentioned that two raters agreed on their classification in 91 out of 100 times. MUNRO (1958), investigated this point, by examining a set of Funkenstein curves on two occasions and comparing the classifications. Another physician also classified the curves twice over, and the four sets of results were compared. The proportion of misclassifications was higher between two physicians than between two occasions for the one physician. Errors of classification tended to be found with a particular group of curves which did not fit easily into the categories, as defined. The proportion of misclassifications was very much less when the curves were classified according to Gellhorn's three types than when Funkenstein's six groups were used. This is to be expected. The conclusion to be drawn from this work is that the method of classifying curves in an important source of error, and therefore of unreliability, and should be replaced by some objective method of classification.

Reliability of measurements

Three papers refer to this problem. MASS (1958), notes that 'a concurrent check on recordings of blood pressure readings by the physician and the technician revealed no significant discrepancies; i.e. differences were all less than 4 mm Hg.' SLOANE, LEWIS and SLATER (1957b) checked the reliability of sphygmomanometry by correlating the pressures recorded by four observers who listened simultaneously to a stethoscope with four sets of ear-pieces. The correlation reported, presumably an average, was 0·94, which the authors considered to be 'encouragingly high.' The most interesting paper on this subject is that by GROSZ and MILLER (1958). These investigators tackled the problem of the reliability of measurement of the whole of the test, by the original and ingenious method of recording the blood pressure simultaneously in both arms. In 48 tests done on 12 patients, they found different response patterns (Funkenstein groups) in the two arms. Only 1 patient showed identical responses in both arms on all four tests. Unfortunately, they do not discuss these findings, and give no opinion on them, although they hint at the possibility of asymmetry of response. Furthermore, the diagnosis of these 12 patients is not given, though it is probably schizophrenia, since 30 out of 33 patients investigated were so diagnosed. In view of what is known of schizophrenics and their physiological responses, it would be unwise to assume that the same results would be found in other types of disorder.

Judging from personal experience, and that of colleagues, it is possible that the results arise from the rapid fluctuation of blood pressure that can sometimes be found (see Fig. 4). Under such conditions, the pressure recorded will depend partly on the exact moment in time when the first sounds are heard in the stethoscope. It is strange that this fluctuation has never been reported, since it has been found by all physicians whom I have questioned and who have themselves carried out the test. Other factors that may produce such differences as were found by GROSZ and and MILLER (1958) are: (a) Occasionally, as the pressure in the manometer falls, the sounds of the pulse are heard in the stethoscope, usually faintly, followed by a silent interval, with the sounds returning and remaining, as the pressure continues to fall. (I myself ignore the first 'isolated' sounds, but it is easy to miss them, or not to notice the silent interval.) (b) Sphygomanometers differ remarkable among themselves, some behaving 'sluggishly' and others giving a lively response. (c) Random sources of error of measurement, including the tension of the muscles of the arm, the placing of the cuff and so on. Some sources of error will effect all the measurements in a curve, and will thus produce a 'bias', but others will vary for each individual measurement. Thus any individual measurement which is used for describing a curve, such as maximum rise or fall of blood pressure, will be liable to a fair amount of error.

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Function fluctuation

The function or functions measured by the test may fluctuate momentarily, and over short or long periods of time. Since the test lasts at least ½ hr, it cannot detect very rapid changes, but repetitions of the test over suitable intervals will yield information on longer fluctuations. It is likely that the emotional state of the patient may affect the test result. Fear of the test itself could doubtless be eliminated by ignoring the result of a first test, and if necessary, a second or third. Consistent changes with repetition of the test have not been reported. The use of a blank test with saline injection, as originally practised by FUNKENSTEIN and his colleagues, is insufficient, because the subjective effects of the active drug could alarm the patient. Many patients "fear the needle," and once the injection has been given, they relax. This may be the explanation of some curves not reaching the original base-line, continuing steadily about 5–10 mm below it.

The fluctuation of function can be measured only by repetitions of the test, and then the result is seen through the distortions introduced by the other sources of unreliability already mentioned. The error introduced by misclassification is ignored by many workers. Thus NELSON and GELLHORN (1958) gave a second test to 11 patients 7 days after the first and found that 'only one was not repeatable'. BRILL, RICHARDS and BERGER (1958) tested 13 schizophrenic patients several times and found that only 2 of them showed the same Funkenstein grouping every time. They found that most of the changes were between group 1 and groups 2–3, and pointed out that this difference was largely the effect of a shift of the curve in relation to the basal level. The same might be said of the difference between groups 2–3 and 6. On this point, they found that the mean basal pressure of group 1 curves was 103·2 mm, for groups 2–3 it was 112·2 mm, and for group 6 it was 132·7 mm. One almost gets the impression that the patients produce more or less the same curve, but that their basal pressures differed, giving rise to the differing groupings. The authors conclude that 'this suggests some over-all relationship between basal blood pressure and prognosis, as indicated by the Funkenstein test'.

In addition to the novel device of taking bilateral tests, GROSZ and MILLER (1958) also investigated other aspects of reliability. They tested 30 schizophrenic patients and 3 others, giving them 4 tests in a series, sometimes after treatment as well as before. In 54 of such series they found only 4 which gave the same Funkenstein grouping, 39 series gave 2 groupings and 7 gave 4. They remarked on the difficulty sometimes found in allotting a group to a given curve. Perhaps for this reason, they also investigated the reliability of an objective measure, the 'area of fall'. A statistical test showed that unreliability of this measure was highly significantly different from zero. The coefficient of reliability came to 0·60 before treatment and 0·52 after. This is lower than that obtained by other investigators (see below) but not greatly so. Perhaps the reason for this is that their patients were suffering from schizophrenia, whereas most other investigations, although including a number of diagnoses, usually include a very large proportion of depressives; but it would be premature to draw conclusions from these results until sufficiently large samples have been taken to stabilize the statistics. Their conclusions that 'the mecholyl test is unreliable as a clinical tool, at least in the type of patient studied', must be accepted, on the understanding that 'clinical tool' means making a prediction for the individual patient. They also review the literature demonstrating that autonomic function is not a unitary phenomenon, from which it follows that a single test cannot measure autonomic function, or, as they put it '(the mecholyl test) is of no value as a meaningful index of the autonomic state'. This must be regarded as an overstatement. A single test cannot give much information about autonomic state, but it does give some. Whether this information is relevant in a given situation, and how much, is another matter; and the authors do not deal with this point.

MAAS and his assistant (MAAS, 1958) gave the mecholyl test twice to 20 male in-patients, suffering from various disorders. Classifying the curves obtained on the basis of favourable and unfavourable prediction, they found that 14 patients gave the same results with both testers, and 6 gave contradictory results. The groupings of the curves were not given. The author considered that the results of the test were influenced by the attitude of the patient to the tester. This is quite possible, but the hypothesis needs to be tested under more stringent conditions, e.g. uniform diagnosis and information about the patient's attitude obtained at the time of testing. The author gives full data for the basal blood pressure, and I have taken the opportunity to test them statistically. The results show that there is negligible difference between the mean results obtained by the two testers (F-ratio < 1). Thus for the group as a whole, the basal blood pressure is the same for the two testers. The difference between the mean pressures obtained in the first and second test is not statistically significant

(F-ratio 1·65, $P > 0·20$) and the differences between patients is highly significant (F-ratio 3·95, $P < 0·01$). The correlation between the first and second basal pressure is 0·61.

The most thorough investigation of reliability was carried out by SLOANE *et al.* (1957b). Classifications of the full test done by different testers had a concordance of 35 per cent; when done by the same tester—11 per cent. This latter figure, however, is based upon 9 patients only. For the mecholyl test, the corresponding results are 47 and 77 per cent. These authors extensively investigated the use of objective measures derived from the test, and found that the full Funkenstein test (using adrenaline and mecholyl) was markedly less reliable than the abbreviated test, using mecholyl only. (This is only one of the reasons why the adrenaline part of the test has been generally abandoned.) They found that the basal blood pressure showed a correlation of 0·92 when the test was repeated with a different tester, and 0·78 with the same tester. This is higher than that obtained from MAAS's results. The reason for this has already been suggested (see above). For the same and different observers, the maximum fall of blood pressure correlated 0·73 and 0·82, the duration of fall 0·61 and 0·45, and the area of fall 0·71 and 0·75. It would have been more informative had the results been calculated separately for the different diagnostic categories, particularly as the authors themselves showed, SLOANE *et al.* (1957a) that the test responses are distinctly different between schizophrenics, depressives and neurotics.

LOTSOF and YOBST (1957) investigated the reliability of the mecholyl test on 15 control subjects, who were given the test on two mornings, 15 patients given the test in the same way, and 15 patients given the first test in the morning and the second in the afternoon. For the "morning" and "afternoon" groups of patients, and for the controls, respectively, the maximum fall of blood pressure correlated 0·77, 0·73 and 0·50 and the area of fall 0·65, 0·71 and 0·41. These figures are obviously of the same order as those of SLOANE *et al.* Thus it can be seen that most investigators have obtained fairly high reliability for objective measures of the test, although not high enough for practical purposes. LOTSOF and YOBST themselves stress this point when they remark that a correlation of 0·61, when used for individual prediction, gives results only 20 per cent better than chance.

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CLASSIFICATION OF THE FUNKENSTEIN TEST

A good method of classification should be based on a theory, itself based on adequate evidence. The classification should be based on objective criteria, as opposed to subjective judgement, and should not depend more than minimally on a single measurement. In the former case, the most important theories are those of FUNKENSTEIN, and of GELLHORN. These have been carefully considered by FEINBERG (1958) in his review of the literature. He concludes that the evidence in their favour is not yet adequate. The classifications based on them still suffer from the need to use individual judgement, there are always some curves that do not fit easily into the usual categories, and objective criteria used by various investigators, such as fall of blood pressure or time required for homeostasis, are purely empirical and suffer from the fact that they are single measurements. Nevertheless, these objective criteria show good reliability and could serve as a basis for using the test for predicting outcome. The 'area of fall' is even more satisfactory, since it is based on a number of measurements.

In the work to be described, an attempt has been made to overcome these difficulties by a new approach: the method of curve-fitting. In accordance with the current tendency to ignore the adrenaline part of the Funkenstein test, only the response to mecholyl has been considered. This leaves one curve to be fitted; the problem then arises, what sort of curve should be used? For this, some theoretical model is necessary, and two come to mind.

The simplest of such models is that which compares the return of blood pressure to base level as analogous to the return of temperature of a cold body to that of its surroundings. The time–temperature curve obtained in such an experiment is described by Newton's law, in which the temperature

equals e^{-kt} where k is a suitable constant, t is the time, and e is the base of natural logarithms. Alternatively, the law may be described in terms of the logarithm of the temperature, which then equals $-kt$. This model need be considered no further for two reasons; it is extremely difficult to fit an exponential curve where the base line is unknown; and in any case, since the blood pressure sometimes rises above the basal level, the analogy is completely destroyed.

What is needed is a mathematical theorem which expresses the process of homeostasis. This would fit all curves, but in order to do so, it would have to be so complex (would require so many parameters) that it would have little advantage over the empirical curve of obtained measurements.

For these reasons, it was decided to consider only the *rate* at which the blood pressure returns to normal and this is adequately dealt with by fitting a straight line to the rising part of the curve. This straight line is then used as a substitute for the empirical curve. The advantages of this procedure are as follows: all the data of the curve is used for determining the position of the straight line, hence errors are diminished by averaging. The maximum drop of blood pressure is determined by the line which has been fitted, i.e. by all the data, not by one single measurement. The time of return of the blood pressure to the basal level, i.e. the time for homeostasis, can be similarly determined by the fitted line. Not only is this time not dependent on one measurement, but it can also be determined even if homeostasis is not reached within the time limit of the test.

The 'area of fall' has been used by a number of workers, and it has the advantage of depending on many measurements of blood pressure, whereby individual errors of measurement tend to cancel out. The area is roughly triangular. When the fitted straight line is used, the area of fall is a right-angled triangle, and its area is exactly determined, for it can be calculated by taking half the product of the 'drop' by the time for homeostasis. As such, it is a completely dependent variable, and gives no further information. Furthermore, the time for homeostasis is itself determined by the 'fall' and the slope of the line. Thus, using the data of a test to derive a straight line which best fits the curve of rising blood pressure, we reduce all the data of the test to three independent variables: basal blood pressure, 'drop' of blood pressure and slope of the line.

Two minor defects remain. A decision must be made about how many measurements should be included to cover the rising part of the curve, and that part only. It is described as a minor defect, because a few measurements more or less will alter the slope of the fitted line by only a very slight amount. The second defect is that, occasionally, a curve is found in which the blood pressure rises within a couple of minutes to above basal level and then slowly sinks. In such a case the slope is negative. The present method is then inapplicable, strictly speaking, but it can be used, when it shows a 'negative drop'. Such test responses occur rarely, giving the minimal proportion of unclassifiable curves. Sometimes the blood pressure not only fails to rise, but may even continue to fall slightly during the course of the test, so that again, a negative slope is obtained. These give rise to no difficulty if we ignore area of fall; though such an area, for the "time of the test", could be calculated.

The four curves illustrated (Figs. 1–4) show a straight line fitted to them. They were deliberately selected because none of them fit the Funkenstein or Gellhorn categories, and they also show clearly the limitations of the method. The curve for patient no. 79, (Fig. 4) also illustrates the 'swinging' blood pressure that is not infrequently met with.

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Application to reliability

The straight line is calculated by the method of least squares. It is represented by the formula $Y = aX + b$, where Y is the pressure at time a, and b is the point where the line cuts the blood pressure (vertical) axis. The figure b is a hypothetical drop of blood pressure, since it is supposed to be present at the moment of injection. To avoid offending common sense, the "drop" of blood pressure is taken as the

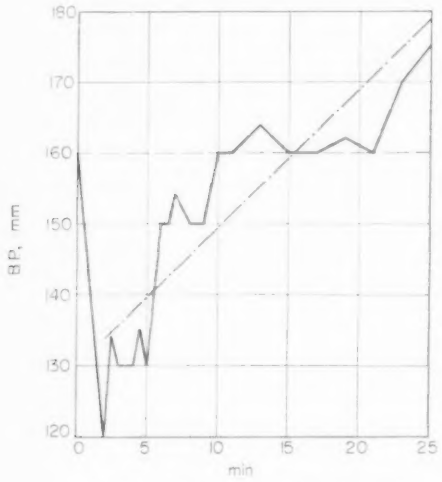

FIG. 1.—Mecholyl test PT No. 5(F)

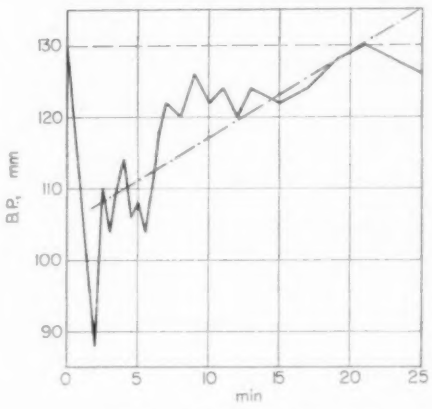

FIG. 2.—Mecholyl test PT. No. 27

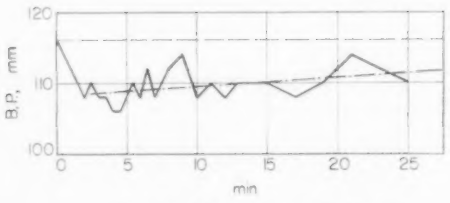

FIG. 3.—Mecholyl test PT. No. 42

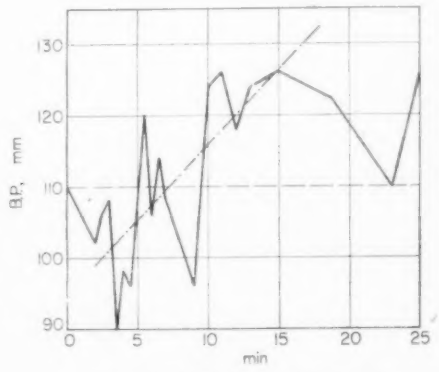

FIG. 4.—Mecholyl test PT. No. 79

point on the line 2 min after the injection. Also, the pressures recorded at ½, 1 and 1½ min after the injection are not used for calculating the line. In the formula, the a which measures the slope represents the tangent of the angle between the line and the horizontal axis. This would give a very skewed distribution of slopes, with the high ones liable to great error. For this reason, the slope has been converted to degrees (from a table of tangents).

DESIGN OF THE EXPERIMENT

A standard Funkenstein test was given to each patient (although only the data from the mecholyl* test are considered here). It was given to two diagnostic groups of patients: chronic schizophrenic and depressive. In the case of the schizophrenic group, the patients were randomly allotted to receive the second test at 1 day's, 3 days' and 14 days' interval. Thus no patient was given the test more than twice, but information is available on the reliability as it changes with increasing time. In the same way, the depressives were divided into 2 groups, receiving the second test at 1 day's and 3 days' interval. It was considered unjustifiable to delay the patients' treatment for longer than this.

RESULTS

(*a*) *In depression*

It can be seen that the test–retest correlations (Table 1) for basal blood pressure are high, and are of the same order as those found by MAAS (1958) and SLOANE *et al.* (1957b). There is a slight diminution of the correlation with the passage of time but it is not significant. The correlations for drop are not quite as high, and again, are of the same order as found by SLOANE *et al.* (1957b). The correlations for slope are low and are not significant. Since both the Gellhorn and Funkenstein classifications depend very much on the slope of the curve, we have here an explanation for some of the unreliability of the test when these classifications are used.

The changes with time of mean basal level and drop (Table 2) are negligible (F-ratio < 1). The same applies to slope, but the variances change with time, being slightly less in the test repeated after 1 day (F-ratio 1·27, not significant) and significantly greater in the test repeated after 3 days (F-ratio 3·25, $P < 0{\cdot}05$). The changes in variance indicate in another way, the unreliability of the slope.

Changes of basal blood pressure with time (Table 2) are negligible (F-ratio > 1), but the variances differ, being greatest on the third-day repeat and least on the first.

(*b*) *In schizophrenia*

The test–retest correlations for basal blood pressure and drop are distinctly lower than in the depressive patients, Table 1. The correlations for slope are varied but on the same level as those for the depressives. Changes of basal blood pressure with time (Table 2) are negligible (F-ratio < 1). So also are the changes of drop with time, but here the variances increase steadily (27 for 1 day, 59 for 3 day and 218 for 14 day intervals) and the differences are very highly significant ($\chi^2 = 14{\cdot}45$, d.f. $= 2$, $P < 0{\cdot}001$). The slope shows no significant change with time (F ratio less than 1), but the variances are not comparable ($\chi^2 = 6{\cdot}34$, d.f. $= 2$, $P < 0{\cdot}05$).

DISCUSSION

The discovery that the basal blood pressure is a stable characteristic of the individual does not come as a surprise. The other two variables show an interesting contrast: the drop is stable, whereas the slope is not. Since the drop is the immediate effect of the mecholyl and must be related to the state of activity of the reflexes maintaining the blood pressure through the autonomic nervous system, then that must be a stable characteristic. The slope is equally a function of the homeostatic

* N.B. The mecholyl used is an aqueous solution, which deteriorates on keeping. It is safe to use it within a month of manufacture.

TABLE 1.—TEST–RETEST CORRELATIONS

	1 day interval	3 day interval	14 day interval
Depression			
Basal blood pressure (mm)	0·97	0·76	
Drop (mm)	0·78	0·75	
Slope (degrees)	0·26	0·48	
No. of patients	15	15	
Schizophrenia			
Basal blood pressure (mm)	0·40	0·51	0·37
Drop (mm)	0·46	0·70	0·17
Slope (degrees)	0·37	0·63	0·10
No. of patients	15	14	14

TABLE 2.—COMPARISON OF MEANS OF GROUPS

	Initial	After 1 day	After 3 days	After 14 days
Depression				
Basal blood pressure (mm)	133·2	131·6		
	139·6		137·7	
Drop (mm)	18·1	20·6		
	21·5		22·7	
Slope (degrees)	27·5	21·5		
	29·5		28·5	
Schizophrenia				
Basal blood pressure (mm)	117·2	115·9		
	124·3		120·3	
	124·2			121·9
Drop (mm)	13·6	13·7		
	14·4		15·6	
	15·4			17·4
Slope (degrees)	23·7	26·2		
	28·9		33·2	
	24·6			35·7

system, but its variability suggests that it is more closely related to the immediate state of the patient. Put in another way, drop and slope illustrate the difference between activity and reactivity. Since reactivity is more closely tied to the immediate situation, it is not unreasonable to find its test–retest reliability relatively low.

What are the defects of this method of assessing the Funkenstein test? It is rather artificial, and although it is customary in many fields of science to use linear functions as approximations to more complex ones, some information must inevitably be lost. In this case, we may lose the information on the rise of the curve beyond basal level, and whether it then returns or not. Such 'rebound' curves are uncommon, and in

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the few that I have found, a rise beyond basal level occurs only in those curves with a steep slope; the converse is not, however, true. Empirically, this method loses another item of information, by ignoring the rapid swings of blood pressure which sometimes occur. Nevertheless, the method has certain advantages. In the first place, it eliminates the qualitative categories and replaces them with continuous variables. This has the immediate effect of making practically all curves 'classifiable'. Secondly, it avoids the problem of deciding when a given curve returns to basal level. Basal levels can undoubtedly change, despite every attempt to achieve stability, and this can completely alter the classification of a given curve. The difficulties discussed by BRILL *et al.* (1958), mentioned above, are relevant here. Thirdly, it eliminates the artificial convention of a 25 min test. Finally, it analyses the test into reliable and unreliable components, pointing the way to further investigations on the nature of the test. With the dissection of the test into reliable and unreliable components, it is possible to use the test for prediction of outcome of treatment in patients, using only the reliable components. It is interesting to note here that LUNDE *et al.* (1958) found significant correlations between improvement and basal blood pressure and mecholyl drop.

SUMMARY

A new method of assessing the results of the mecholyl test is described, based on the technique of fitting a straight line to the rising part of the curve by means of least squares. This method describes a given mecholyl test in terms of three parameters, basal blood pressure, drop of blood pressure and slope of line. The first two are reliable and the last is unreliable. The method was used for measuring the reliability of the test in separate groups of schizophrenic and depressed patients. The results show that reliability is slightly less in the schizophrenics for basal blood pressure and drop, and slightly more for slope. It is suggested that investigations on the predictive value of the test should use only the reliable components.

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PSYCHOLOGICAL STRESS AND VISCERAL ULCERATION*

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Several authors have reported that the psychological stress induced in rats during conflict conditioning (Sawrey *et al.*, 1956; Sawrey and Weisz, 1956) and in monkeys during conditioned 'anxiety', conditioned avoidance and punishment training (Porter *et al.*, 1958) may cause stomach and duodenal ulceration as well as other forms of systemic damage. Control experiments have shown that shock alone is not sufficient to cause ulceration in monkeys (Porter *et al.*, 1958) but may contribute slightly to ulceration in rats (Sawrey *et al.*, 1956). The learning process appears to be definitely implicated; it is not clear from previous studies, however, whether learning *involving* shock (or, presumably, other aversive stimuli that arouse emotion) is important, or whether the learning process may, under certain conditions, cause ulcers, in the absence of aversive stimulation.

The purpose of the present study was to check the degree to which a non-shock (and presumably non-emotional) learning situation might cause ulceration or other grossly observable organic insult in the rat. That such might be the case is suggested by Amsel's notion (Amsel and Roussel, 1952) that all learning is inherently stressful (or in his terms, productive of a "frustration drive"), to the degree that non-reinforcement of a learned response occurs. Non-reinforcement of partially learned habits always occurs during the initial phases of any learning situation while the animal is learning what is expected of him. It may also occur as part of an experimental design, as, for example, during an aperiodic reinforcement schedule and during extinction. The present experiment, although performed for other reasons, seemed admirably suited to test the extent to which a long-term non-emotional learning situation would be productive of ulcers. This is true because the experiment was run for 6 months, allowing ample time for ulceration to show up, if it were going to show up; the reinforcement was presented on an aperiodic (random) schedule; and, all animals were run for 3 weeks of extinction trials.

The procedure consisted of training 3 groups of 10 rats each to run a 5 ft alley for water reward while motivated by 22 hr water deprivation. Two of the groups had no way of knowing (until they entered the goal box) whether or not the single daily trial would result in water reward, whereas the third was always given a light and sound signal in the start box if water was to be found in the goal box. Although this feature of the experiment was important for other reasons (not of interest here), the uncertainty involved when animals of the 'no-signal' groups were run in the alley probably enhanced whatever frustration was aroused by the aperiodic reinforcement schedule employed in the experiment.

Following the last extinction trial the rats were killed in a large anaesthetizing jar, and opened with a mid-ventral incision. The stomach and duodenum, as well as the kidneys, lungs and heart were removed for gross examination. This was accomplished by free-hand sectioning of the organ into 1–2 mm slices in all cases except the stomach and duodenum. These were incised and the contents of the lumen were washed out. The mucosa were then inspected for evidence of gross lesions.

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Six of the subjects (2 from each group) had suppuration of one or both lungs. This frequency of lung pathology, however, falls within the normal range expected in this strain of hooded rats. No other gross abnormalities were observed.

The lack of any ulceration in the stomach and duodenum suggests strongly that ulceration reported in other studies probably was due to an interaction between the learning process and the sensory or post-stimulation effects of an aversive reinforcer, or both. The results of the present experiment lead to the conclusion that non-emotional learning does not appear to be productive of ulceration.

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PSYCHOLOGICAL FACTORS IN IRON ABSORPTION

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THE absorption of iron is governed by many variables, as shown by the recent reviews of JOSEPHS (1958) and BOTHWELL *et al.* (1958). Amongst such factors, NORDENSEN *et al.* (1949) included the psychological, for in studying the absorption of different iron compounds, they examined their patients for the presence of 'neurosis'. This seems to have been on empirical grounds, for neither criteria nor reasons are given, but they implied that their results might in some way be affected by this factor. Support for this view seems to come from the work of GRACE and DOIG (1954). These workers made twenty-six observations on a subject with a gastric fistula and found that 'absorption (of iron) was optimal on days of good spirits, and below optimal on days of conflict and indecision'. Such a claim merits further investigation, since measurable metabolic changes which can be correlated with the mental state are few, but may have important implications.

GRACE and DOIG give neither clinical nor technical details, but imply that their subject was psychiatrically normal, and that the mood changes were transient. Despite their importance, such observations are difficult to confirm on normal subjects, because different observers may easily disagree about the prevailing mood at a given time. It therefore seemed worth examining whether in a group of depressed patients, changes were present corresponding with those of GRACE and DOIG. In such patients one might reasonably expect the same psychophysical correlations as were present in a normal group. In addition, all could agree on the state of the mood at the time of the experiment, and the change after recovery would be unequivocal. Obviously such an experiment should be made on a group of patients. BOTHWELL *et al.* (1955) showed that investigation of iron absorption in a single case yielded no consistent results, and this criticism may be levelled at the study of GRACE and DOIG. In a group, however, these inconsistencies would tend to be eliminated, as BOTHWELL *et al.* agree.

Such a study might show that the prevailing mental state was consistently related to iron absorption or that the relationship existed only where specific psychiatric features could be found. Finally, no evidence whatever might emerge in favour of such a relationship.

MATERIAL

The patients selected were a group of women, between the ages of 34 and 56, who were admitted to hospital suffering from depressive illnesses of moderate or great severity. Their illnesses varied from 1 month to 3 years in duration (average 13·7 months). Patients concurrently suffering from physical illnesses or minor infections were excluded from the series, and investigations were deferred during menstruation. Ultimately, however, no significant differences were found to exist between the post-menopausal and the younger group of women.

METHOD

The technique employed was that described by BOTHWELL and MALLETT (1955). A preliminary trial yielded results of an accuracy comparable with their own.

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For 24 hr before the test no eggs were given, and milk was restricted to half a pint. No drugs were given on the day of the test, and in any case only barbiturate sedation on the previous days.

Each patient was examined personally, in collaboration with the clinician responsible; the consistency of the depression was confirmed. The following morning, after a fasting specimen of blood had been taken (7.30 a.m.), a dose of ferrous sulphate (2 mg per kg body weight) was given, dissolved in half a glass of tap water. Specimens of blood were subsequently taken at 1, 3 and 5 hr after the dose, the patient remaining in bed and fasting throughout. The serum was later separated and refrigerated, the estimations being carried out within a few days. After recovery was complete, and shortly before discharge, the procedure was repeated: each patient thus served as her own control.

On each occasion the haemoglobin was estimated: no correlations were found to exist between these levels and the nutritional status on the one hand, and the curves of iron absorption on the other.

TABLE 1.—SERUM IRON VALUES, MICROGRAMS, (FASTING 1, 3 AND 5 HR SAMPLES), FOLLOWING AN ORAL DOSE OF FERROUS SULPHATE. ESTIMATIONS BEFORE AND AFTER RECOVERY FROM DEPRESSION.

Case	Age	Pre-recovery F	1 hr	3 hr	5 hr	Post-recovery F	1 hr	3 hr	5 hr
(1)	34	60	184	328	322	66	170	234	219
(2)	34	33	110	171	165	12	147	412	425
(3)	36	113	227	388	365	183	217	294	265
(4)	46	126	204	233	171	75	132	225	245
(5)	56	125	137	162	142	57	147	136	122
(6)	47	84	128	136	113	18	86	148	141
(7)	56	115	295	222	169	151	241	211	164
(8)	45	48	84	82	98				
(9)	44	100	173	214	191				
(10)	41	207	280	295	283				
(11)	44	211	240	280	258				

RESULTS

Table 1 presents the values of serum iron obtained in micrograms per 100 ml. In the last four cases, no 'post-recovery' test was carried out: examination of the earlier cases had already shown that nothing would be gained by a second test in those who followed.

Because of the wide degree of variance, stabilization of these figures was carried out by taking their square roots.

DISCUSSION

Examining the curves obtained, highly significant differences were found to exist between the fasting and the 1, 3 and 5 hr values, showing that the serum iron rose significantly in all cases after the oral dose ($P < 0{\cdot}01$). A second analysis of variance was carried out to test whether differences existed between the 'pre-recovery' and the 'post-recovery' groups. This allowed the testing of possible interaction between the factors of recovery (pre- and post-) and of differences in the timing of samples. No significant differences were found to exist; the patients behaved similarly, whether or not they were depressed.

Comparing these findings with those of GRACE and DOIG it may be asked whether the mental state was comparable. Their patient's predominant symptoms were 'conflict and indecision': these showed depression. In the present series, only case (2) showed a relationship similar to theirs, but she presented no clinical features unique

in the series, although tension and anxiety were conspicuous. The possibility that specific symptoms, such as these, are related to differences in iron absorption, might be tested in patients with anxiety states. Otherwise, so far as these results apply to the finding of GRACE and DOIG, it seems that the relationship they claim may in fact be due to a technical artefact.

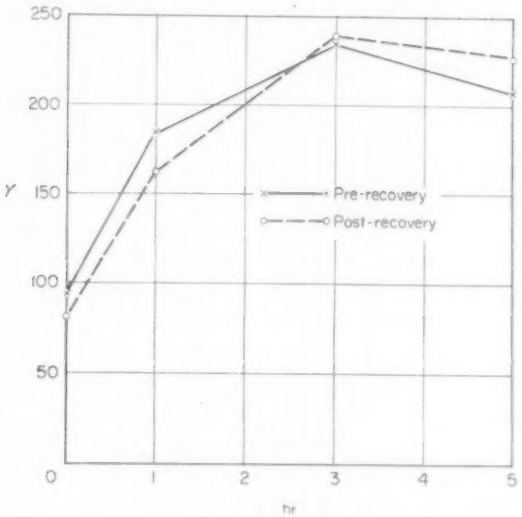

FIG. 1.—Curves of the mean values of serum iron from seven patients, before and after recovery from depression.

CONCLUSION

In a group of depressed patients, no evidence was found that the levels of serum iron, following an oral dose, are related to the mental state. The implications of this finding are discussed.

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PSYCHOSOMATIC CORRELATES IN CONTACT DERMATITIS: A PILOT STUDY*

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INTRODUCTION

ONLY a proportion of the population becomes sensitized to skin contactants, and laboratory experiments have shown that the skin of some individuals can be sensitized more readily than that of others; while once established, the allergic process manifests itself with varying intensity at different times (BROWN, 1922; CORMIA, 1936; KANOF and ROSTENBERG, 1941; KEENEY *et al.*, 1941; MCNAIR, 1921; SCHWARTZ *et al.*, 1947; SHELMIRE, 1939; WHITE and BAER, 1950). Whereas atopic dermatitis has often been studied from the constitutional and psychological viewpoints, contact dermatitis has been relatively neglected, despite its importance as an industrial problem. SCHWARTZ *et al.* (1947), in a list of predisposing causes, make no mention of emotional factors, or of constitutional factors other than the type of skin. Genetic factors may influence ease of sensitization (CHASE, 1941; ROSTENBERG, 1954), although a contrary view has also been expressed (Editorial, *J. Allergy*, 1953). ROSTENBERG asserts that separate genes affect atopic sensitization (immediate wheal) and contact sensitization (delayed eczematous type). However, psycho-physiological processes are being increasingly implicated in allergic diseases (ABRAHAMSON, 1956; BURDEN, 1955; GRAHAM *et al.*, 1950; VAN DE ERVE and BECKER, 1935; WEISS and ENGLISH, 1957). Recent experimental work in animals has indicated the influence of the brain-stem reticular system on allergic processes (FREEDMAN and FENICHEL, 1958).

STOKES *et al.* (1943), in their paper on 'Contact, contact-infective and infective-allergic dermatitis of the hands', hold that constitutional and psychophysiological factors, as well as environmental factors predispose to the disease; and that emotional shock or crisis may be the exciting cause. CORMIA for instance (1936) has recorded a case in which contact dermatitis from a menstrual pad was apparently precipitated by emotional stress. GUY (1952) in part confirmed these views using the guinea pig as an experimental animal, by showing that stress produced a heightened reaction to established allergens; he failed to demonstrate that stress facilitates the *development* of allergy.

The patch test, a form of contact dermatitis, is known to be unstable in humans. The persistence of sensitivity long after contact has ceased (KANOF and ROSTENBERG, 1941), so-called "spontaneous" desensitization and flare-up (WHITE and BAER, 1950) are all well documented experimentally. There are numerous accounts of variations in established cutaneous hypersensitivity concurrent with changes in the emotional state of the patient, (CORMIA, 1947; GRAHAM *et al.*, 1950; MARCUS and SAHLGREN, 1936; WITTKOWER, 1952). Although most of the cases reported are of urticaria or atopic dermatitis (in which the shock tissue is the cutis rather than the epidermis), the two types of sensitivity probably invariably overlap (ROSTENBERG, 1954), and

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recent work incriminates the role of the cutis in contact dermatitis (BAER and ROSENTHAL, 1957). These fluctuations in sensitivity suggest the possibility of psychological influences concurrent with changes in the life-situation.

SUBJECTS

A psychological investigation was therefore carried out on a group of 20 individuals who had suffered from contact dermatitis and a group of matched controls. The subjects were 40 undergraduate and graduate students at Cornell University, all of Caucasian stock and born in the U.S.A. Participation was voluntary, but passive in so far as the subjects were invited directly and individually; only one refusal was met.

The experimental group of 20 was collected by scrutiny of in-patient registers over the past 4 years (8), and of the records of the consultant dermatologist (9); of the remaining subjects, 1 was admitted in the current year with poison ivy dermatitis, and 2 who had been admitted with infectious mononucleosis gave a past history. Diagnoses were reviewed, and as a result three prospective subjects were rejected. Patch test confirmation was made, except in the poison ivy cases. The allergens were: *Rhus toxicodendron*, 14; formalin, 3; tincture of benzoin, 1; hydroquinone, 1; a proprietary furniture polish, 1. At the time of the study the subjects were free from relevant lesions, except for two, who were recovering. Six subjects were female. Age range was 18–30 (mean 21·7 years).

As 14 of the 20 experimental subjects are, or have been, sensitive to poison ivy, the reasons for accepting this condition as a form of contact dermatitis need mention. The oleoresinous sap of *Rhus toxicodendron* is a primary irritant as well as a potent allergen, but the great majority of individuals with a history of sensitivity give a positive patch test (KEENEY *et al.*, 1941). Local differences in proliferation of the plant probably account for variations in incidence of sensitivity, which ranges from 40–70 per cent in different parts of the U.S.A., whilst work on the Baffin Island Eskimos and on infants shows that previous contact is necessary for sensitization (STRAUS, 1931).

The control group was matched as nearly as possible, for age, sex, race, cultural background, educational level and occupation. Students admitted to Cornell Infirmary, afebrile and of the appropriate age, were asked if they had ever had contact or poison ivy dermatitis. If not, they were invited to participate. Diagnoses were; rubella 7, infectious mononucleosis 2, appendicectomy, contusion of chest wall, duodenal ulcer, electrical burns, epidermophytosis, furunculosis, gastro-enteritis, influenza, muscle strain and spontaneous pneumothorax. The twentieth subject was an ex-student who was asked to participate because no student of the required age was available. Six subjects were female. Age range was 18–32 (mean 20·6 years).

PROCEDURE

Each subject was seen at least twice. At the first session the Rorschach test was administered according to the technique of BECK (1945). The subject was then handed an envelope containing the 'Allerhand questionnaire', and the *P–S* Experience Blank. (The former is claimed (ALLERHAND *et al.*, 1950) to distinguish between neurodermatitis, presumed non-psychogenic dermatoses and general medical cases; the latter was designed to elicit psychological and physiological differences between neurotics and non-neurotics (MCFARLAND and SEITZ, 1938) and is said to be useful in discovering whether a subject's predominating dysfunction is psychological or physiological.) They were instructed to complete and return the forms. At the second session held with 19 of the experimental group only, detailed life histories were examined for evidence of time relationships between significant emotional stress and the first manifestation and exacerbation of contact allergy; the time taken over this varied from 1½ to 4 hr; in some cases a third visit was necessary.

RESULTS

(a) *Rorschach analysis*

Protocols were scored by BECK's method (BECK, 1945, 1949), and tables were drawn up listing factors and formulae thought to be worth analysing. These included some evolved by the Klopfer school, and HARROWER-ERICKSON's 'neurotic and hysterical signs' (HARROWER-ERICKSON, 1943). The unequal distribution of 'hysterical signs' provided an important (though not statistically significant) clue. Of 12 differences between the experimental and control groups that were tested, none reached the 10 per cent level of significance, though 4 reached the 10–20 per cent level, the comparison of the total number of 'hysterical signs' being one of them. The experimental group (*X*) gave a total of 24, the control group (*C*) 34. This suggested that introversives and extratensives may not have been equally distributed in the two groups. Analysis showed this to be correct, the number of experimental introversives (*X*1), experimental extratensives (*XE*), control introversives (*C*1) and control extratensives (*CE*), being, respectively, 10, 10, 6 and 14.

A total of 35 items were compared for statistically significant differences. Ten, all discriminating between introversives and extratensives, called for rejection of the Null hypothesis at the following levels of probability (two-tailed *t* test):

1 per cent—*Y* per cent (*X*1 : *C*1).

2 per cent—*L*(*XE* : *CE*).

5 per cent—*F*+ : *M*(*XE* : *CE*); *FY* + *FT* : *F* (*X*1 : *C*1).

10 per cent—*L*(*X*1 : *C*1); *F* + : *M* (*X*1 : *C*1); *T* per cent (*X*1 : *C*1); *V* per cent (*X*1 : *C*1); *FY* + *FT* + *FV* : *F* (*X*1 : *C*1); *W* per cent (*X*1 : *C*1).

The remaining 25 of the 35 differences could not be supported at the 10 per cent level of probability, but 9 reached the 10–20 per cent level, 4 of them being directly but inversely related to those assessed to be significant. So notable are the inverse relationships between the mean scores of introversives and extratensives, that tables have been drawn up to clarify them.

L. The ratio of all scorings involving any determinant other than form, to the total number of form responses, is said to be an index of recourse to inner personality resources and resilience (BECK, 1949). This correlates negatively with *F* per cent, which is an index of constriction and rigidity (KLOPFER *et al.*, 1954).

	X	*C*	*P*
I	1·4	0·9	0·05–0·1
E	0·9	1·8	0·01–0·02

F+ : *M*. The proportion of 'good' form responses to movement responses is said to be an index of the ego's check against the pressure of feelings (BECK, 1951).

	X	*C*	*P*
I	1·9	3·7	0·05–0·1
E	7·7	3·8	0·02–0·05

Y per cent. The percentage of shading responses is said to be related to a low threshold of sensitivity to events bearing potency of danger, and chronic anxiety (BECK, 1949).

	X	*C*	*P*
I	22·6	12·4	<0·01
E	14·2	19·0	0·2–0·3

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T per cent. The percentage of texture responses is said to be related to erotic frustration and 'affect hunger' (BECK, 1949).

	X	*C*	*P*
1	7·4	2·7	0·05–0·1
E	4·1	5·8	0·1–0·2

V per cent. The percentage of vista responses is said to be related to self-appraisal and inferiority feelings (BECK, 1949).

	X	*C*	*P*
1	2·9	5·5	0·05–0·1
E	4·1	5·5	0·1 –0·2

FY + FT + FV : F. This ratio of responses in which form is combined with shading, texture and vista effects, to those using form alone, is an approximation to KLOPFER's *Fc + FK : F* ratio, which is said to be an index of affectional anxiety (KLOPFER *et al.*, 1954).

	X	*C*	*P*
1	0·60	0·38	0·05–0·1
E	0·32	0·68	0·1 –0·2

FY + FT : F. If the vista responses, which are not correlated with the *Y* and *T* scores, are excluded, the following result is obtained:

	X	*C*	*P*
1	0·55	0·27	0·02–0·05
E	0·22	0·38	>0·5

W per cent. The percentage of whole blot responses is said to be related (as well as to intelligence) to compulsiveness (BECK, 1949; KLOPFER and KELLEY, 1942); though a negative correlation has also been claimed (ESCHENBACH and BORGATTA, 1955).

	X	*C*	*P*
1	32·1	17·2	0·05–0·1
E	24·7	37·4	0·1–0·2

The statistically significant results are seen to fall into two main groups, dealing with indices relating to (1) rigidity and constriction (*L*, and *F+ : M*), and (2) affectivity (*Y* per cent, *T* per cent, *V* per cent, *FY + FT + FV : F*, and *FY + FT : F*). The differences in (1) all show differences significant at the 10 per cent level at least, for both introversives and extratensives, though the differences only reach the 5 per cent level at least, for the extratensives. On the other hand, the differences in the indices in (2) reach the 10 per cent level, at least, only for the introversives (the 1 per cent level in the case of *Y* per cent).

To test the discriminant function of these Rorschach indices, a table was drawn up listing for each student whether the individual value was above or below the mean for the whole group of 40 students. From this it appeared that the indices *F+ : M*, *Y* per cent and *FY + FT : F* had the greatest discriminant function: 8 out of 10 in *X*1, and 5 out of 10 in *XE* were in the expected direction,

compared with only 1 in *C*1 and 4 in *CE*. Further, subjects who did not conform were frequently in KLOPFER's ambiequal group: 2 out of 2 non-conformers in *X*1, 1 out of 5 in *XE*, 0 out of 1 in *C*1 and 2 out of 4 in *CE*.

A tentative scoring scheme was devised, based on these results, and on the hypothesis that subjects with a history of contact dermatitis tend, if introversives, to be unconstricted ($F+ : M <$ average) and to show high affectional anxiety (Y per cent $>$ average and $FY + FT : F >$ average); and if extratensives, to be constricted ($F+ : M >$ average) and to show low affectional anxiety (Y per cent $<$ average and $FY + FT : F <$ average). Each of these 'signs' scored 1 mark if in the direction predicted. A score of 3 is made by 65 per cent of experimental *Ss*, and only 25 per cent of controls. The discriminant function is higher for introversives; 3 being scored by 80 per cent of *X*1 and only 17 per cent of *C*1 (cf. with 50 per cent in *XE* and 29 per cent in *CE*).

This value is enhanced slightly by a scheme using the barrier and penetration scores of FISHER and CLEVELAND (CLEVELAND and FISHER, 1956; FISHER and CLEVELAND, 1955). In addition to the scores defined above ½ point was scored if (1) the barrier score was greater than average, or (2) the penetration score was smaller than average for the 40 *Ss*. A score of 2½ or more is made by 80 per cent of experimental *Ss*, and only 35 per cent of controls. Again the discriminant function is higher for introversives; the criterion achieved by 90 per cent of *X*1 and only 17 per cent of *C*1 (cf. with 70 per cent of *XE* and 43 per cent of *CE*).

The barrier and penetration scores, which appear to be related to the body image, were obtained retrospectively on a blind basis by Dr. S. FISHER. The results were in the direction that might be hypothesized (experimental *Ss* showing higher barrier and lower penetration scores than control *Ss*), with introversives and extratensives moving in the *same* direction, but *t*-tests showed a significance at only the 10–20 per cent level for $X : C$ on both scores, and $X1 : C1$ on the barrier score; and even less significance for the other groups. (Means for *XE* and *CE* were almost identical on the barrier score.)

(b) *Allerhand questionnaire and* P–S *experience blank*

These revealed no statistical significance between the groups or subgroups. The *P–S* blank showed a tendency for instability in the experimental subjects to be psychological, and in the controls to be physiological; but numbers were too small to apply tests of significance.

(c) *Histories*

The major common factor appeared to be insecurity of affection in childhood, 9 subjects being brought up in a turbulent or broken family setting, and 5 in a strict and emotionally cold atmosphere. First or subsequent attacks of contact dermatitis seemed to be at times of special emotional stress in 18 of 19 histories. These stresses occurred mainly in ambivalent relationships with parents or love partners, except in 2 involving work stress in obsessional personalities and 2 where both factors were mixed.

DISCUSSION

The statistical material reveals a notable consistency, in that 9 out of the 10 significant 'hypotheses' fall into two main groups relating to (1) constriction and rigidity, and (2) affectional needs and anxiety; this is moreover only when taking into account the differences in the responses of introversive and extratensive subjects. It suggests that introversives who have had contact dermatitis are less rigid and constricted, and have higher affectional needs and anxiety than introversives with a negative history; and that extratensives who have had contact dermatitis are more rigid and constricted, and tend to have lower affectional needs and anxiety than

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extratensives with a negative history. The significance of the differences in *W* per cent is not clear, because as mentioned above contradictory interpretations have been made. The observations of ESCHENBACH *et al.* (1955) would support the evidence that experimental introversives are less rigid, and experimental extratensives are more rigid, than the corresponding control groups.

The facts that the difference between the response patterns of introversives and extratensives in the two main groups was completely unexpected, and that the study had no specific hypothesis in mind, weaken the objections to non-blind testing. This Rorschach study has advantages over previous ones in dermatology, the subjects being tested when free from relevant skin lesions or when recovering (2 cases) thus avoiding possible effects from the dermatitis itself. Moreover the experimental and control group were closely matched, and neither group contained subjects psychologically incapacitated. Rorschach results appear to have been reported in detail in only three previous papers on dermatoses (PLESCH, 1951; LEVY, 1952; WHITE *et al.*, 1956), none of them on contact dermatitis. None of these workers have related their results qualitatively to the experience type (*I* : *E*), even though the clinical assessments of KLABER and WITTKOWER (1939) and KEPECS *et al.* (1951) suggest it may be important. The former authors described two groups of rosacea patients; one containing introverted and sensitive subjects, and the other containing extraverted and some aggressive subjects. The latter authors described two groups of patients with atopic dermatitis: one emotionally labile and tending to hysteria, the other rigid and tending to compulsiveness. The discriminant function of the selected indices is high for the introversives only and has not been tested on other groups, but is notable because we are dealing with the vague factor of susceptibility, so that groups *X* and *C* are likely to be impure; *X* probably containing people exposed to extremely powerful allergens or primary irritants, and *C* containing young adults who may yet develop contact dermatitis.

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SUMMARY

Psychological differences were sought between 20 student volunteers with a history of contact dermatitis, and a matched control group with a negative history. The Rorschach test, Allerhand questionnaire and *P–S* experience blank were administered to both groups; focused interviews with the experimental subjects explored temporal relations between areas of emotional conflict significant to the individual, and the clinical onset and exacerbations of cutaneous hypersensitivity.

Positive Rorschach results were only revealed when the two main groups were divided into introversives and extratensives. Then, of 35 'hypotheses' tested, 10 were significant at the 10 per cent level: 1 at the 1 per cent level, 1 at the 2 per cent, 2 at the 5 per cent and 6 at the 10 per cent level. These fell into two main groups, relating to (1) constriction and rigidity and (2) affectional needs and anxiety. The discriminant function of these indices was found to be considerable especially for introversives.

The questionnaires revealed no clear differences between the two groups. The histories showed emotional conflict to be mainly in relations with parents or other love objects; and highly suggestive time relationships were present in 13, and possibly suggestive relationships in 5, out of 19 histories obtained.

Acknowledgements—It gives me great pleasure to thank Dr. N. S. MOORE, Director of Student Health Services, Cornell University, for his encouragement and organization of the generous facilities for the work; Dr. J. SUMMERSKILL, Clinical Psychologist, for his ever ready advice and guidance; Mr. WM. L. SMITH who performed a great part of the initial statistical analysis; Dr. S. FISHER, Baylor University, who kindly obtained penetration and barrier scores from the protocols, and the 40 students, without whose co-operation the study would not have started.

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J. Psychosomatic Research, 1959, Vol. 4, pp. 140 to 147. Pergamon Press Ltd. Printed in Northern Ireland

BOOK REVIEWS

D. E. BROADBENT: **Perception and Communication**. Pergamon Press, London, 1958. pp. 338. 55s.

Perception and Communication is an important, interesting, intriguing and at times infuriating book. It covers a wide field, describing on the one hand numerous experimental researches, conducted by the author and his colleagues at the Applied Psychology Research Unit of the Medical Research Council; these deal largely with certain phenomena in the field of audition such as selective listening (i.e. listening to several channels simultaneously), verbal and bodily responses and the ability of the organism to perform several tasks simultaneously, and also the effects of noise on behaviour. On the other hand, there is also an extensive effort to relate these data to modern learning theory and to substitute for the widely used concept of *inhibition* that of a perceptual *filter*. Among the important areas brought together in this experimental and theoretical effort are vigilance, attention, skill and learning. It will be obvious that this book contains rich if not always readily digestible fare and the reader must be warned that the treatment is rather technical in many instances, making use as it does of the peculiar vocabulary of modern information theory.

Indeed one of the major tasks the writer has set himself is that of demonstrating that the vocabulary of information theory is better suited to the phenomena under discussion than of that more customarily employed by psychologists. Up to a point he is probably correct, due largely to the fact that he is working with auditory data rather similar to those in connexion with which information theory was originally developed. Information theory becomes less relevant the further he goes away from these data and indeed he has to call on several other hitherto little known theories, such as those of UTTLEY and DEUTSCH, to give a more or less comprehensive account of some of the effects of learning. To the theorist these efforts will be of absorbing interest and they will undoubtedly play a major part in future controversies. Judgement about them at the present moment might well be considered premature but to the reviewer it seemed that the proposed revolution in theory did not amount to very much more than a simple renaming. BROADBENT seems to be particularly opposed to theories involving the concept of inhibition, and he strongly criticizes HULL's account. When this criticism is applied to the peripheral parts of HULL's theory, and to the MILLER–MOWRER 'work inhibition' hypothesis, it is well enough justified, but then such criticisms have been made for a long time and few people still accept these views. When we look at a more modern account of inhibition in terms of central processes such as is given in the 'Dynamics of Anxiety and Hysteria', it will be found that there are hardly any differences between the properties of *inhibition* and the *filter* suggested by BROADBENT as an alternative. Both concepts in fact have much the same empirical content and it is difficult to understand his strong aversion to one term as opposed to the other.

In addition to his interesting theoretical contribution, BROADBENT recounts much experimental material not hitherto published in readily available form. These studies are all well organized, competently executed and constitute a genuine contribution to knowledge in a field that has been relatively neglected. Auditory research has always taken second place when compared with visual research, and BROADBENT's contribution does something to close that gap. He even ventures into fields hitherto out of favour among Cambridge psychologists, such as that concerned with individual differences. It is in the chapter dealing with the different types of reactions of extraverts and introverts that psychiatrists will perhaps find his most interesting contribution, and the possibility that some of these tests may eventually throw light on diagnostic and other clinical problems should not be too lightly dismissed.

Altogether then this is a book which will be indispensible to psychologists working in any of the many fields touched upon here; portions of it will be of great interest to psychiatrists and perhaps also to physiologists and neurologists. The price of 55 shillings for a small book of 300 pages is rather exorbitant and the production is not all it might be. One figure is printed up-side down, dates

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in the text do not always agree with dates in the bibliography, and the index is a very perfunctory affair—such a topic as reminiscence does not appear in it at all although it has an important place in the book itself.

H. J. EYSENCK

W. CAUDILL: **The Psychiatric Hospital as a Small Society**. Harvard University Press, Cambridge, Mass., 1958. 406 pp.

THE author, a social anthropologist with training in psychiatric institutes and psychoanalytic theory, studied over a 10 month period the fifty bed hospital community at Yale Psychiatric Institute. Hospital life is described in terms of therapy, administration and human relations.

A detailed story of one patient's hospital stay is used to illustrate problems in therapy and how they are influenced by interpersonal relationships at various administrative levels of the hospital. By piecing together phenomena occuring simultaneously at three such levels over a period of weeks, the author attempts to explain a 'collective disturbance,' that is, a breakdown in the smooth operation of the institution owing to conflicts and misunderstandings among staff and employees sufficient to affect the management of the patients. The author points out that a collective disturbance may not necessarily be detrimental to the patients and, indeed, that it may have a therapeutic effect. He concludes that 'rather than attempting to do away with the processes that make up a collective disturbance, what is needed is the development of methods for studying the covert emotional structure in its relation to the overt social structure with the goal of first coming to some understanding and then perhaps bringing about changes in both.'

In calling for more information about hospital events and better communication, the author states: 'there must be a greater openness among staff members than is usually the case at present, and a willingness on the part of the staff to examine their own motivations rather than to project problems on to the patients. In order to achieve such a state of affairs, however, changes in the organization and atmosphere of the hospital must be made so that neither staff nor patients are punished for their efforts at greater openness and understanding.'

CAUDILL, in short, has presented a picture of the hospital community somewhat separate, but interrelated worlds, or 'open systems,' as he calls them brought together and all bearing on each other and all thereby affecting the therapeutic process for the patient.

C. A. ADSETT

R. D. TONKIN, M.D., F.R.C.P.: **The Story of Peptic Ulcer.** W. B. Saunders Co., Philadelphia and London, 1957. 71 pp.

DR. TONKIN's booklet gives a short account of our present knowledge about peptic ulcer. It deals with anatomy, physiology, incidence, distribution and causation in a way that will make these complicated matters easily digestible for the lay reader. The book has a second part where TONKIN gives a lot of very sensible suggestions for outwitting 'the little villain'.

The author's aim has been not only to inform, but also to interest and amuse. It is quite obvious that he has succeeded in doing so, using a minimum of words and a maximum of drawings. These are made by RAY HELLIER in an endearing and exquisitely meaningful way.

TONKIN's idea has not been to make the victims of peptic ulcer their own doctors, and so the booklet does not contain anything about symptomatology and diagnosis. He has started his work with a feeling of dissatisfaction at the inadequacy both of the advice, and of the usual diet sheet meted out to the multitude of peptic ulcer patients. The time factor makes it often impossible for the doctor to give his patients an insight into the nature of their disorder. This booklet might be of great help. Given to the patient it may give him a good starting point for further discussions with his doctor.

GERDT WRETMARK

Bridging the Gap. From Fear to Understanding in Mental Illness. Edited by R. F. TREDGOLD. Christopher Johnson, London, 1958. 270 pp., 30s.

IN the past, mental illness and its treatment has been a subject of horror and fear for the majority of people. Even today there still exist many prejudices, even among doctors, about the approach to the mentally ill. A description of the functioning of the mental health services, given by several psychiatrists and members of organizations involved in the care of mental illness, is therefore a welcome help for the better understanding of the problems of the admission, treatment, discharge and eventual rehabilitation of the patients.

The authors moreover put forward an interesting viewpoint, and make suggestions as to the future of the mental health services. The whole tenor is that, wherever possible, people who are mentally ill should be treated by the same sort of procedure as those who are physically ill.

The book addresses itself to a large public. But even specialists in the field may profit from it, particularly as it concerns the problems of rehabilitation, attitudes toward the mental defective and the psychopath, and the care of the elderly.

R. A. PIERLOOT

K. MENNINGER: **Theory of Psychoanalytic Technique.** Menninger Clinic Monograph Series, No. 12. Imago Publishing Company, London, 1958. xiii + 206 pp. 25s.

IN assessing this book by a very eminent and veteran American analyst it is important to be clear about its aim and to whom it is addressed. Though it never strays far from practical issues, it is concerned primarily with the theory rather than the practice of technique. It embodies Dr. MENNINGER's teaching to students of psychoanalysis at his seminars in the Topeka Institute for Psychoanalysis. Although the preface indicates that it is intended for a wider public than that of psychoanalytic students, it should, I think, be judged principally as a student's textbook

Following a brief introduction and historical review, the book opens in a deceptively simple manner, somewhat labouring the point that analytic therapy is in the nature of a contract, a point of view which is kept before the reader throughout the book. The exposition remains clear, but is not in fact over-simplified. It is honest, matter-of-fact and practical, even if it is about theory, and there are numerous felicities of expression, as where Dr. MENNINGER says that the patient asks for the moon and we give him a telescope. Other authors are quoted extensively, though curiously enough JAMES STRACHEY's theory of the mutative interpretation is not mentioned.

There is a full discussion of the analytic regression, of transference and countertransference, of resistance and interpretation, and the book ends appropriately with a chapter on the 'Termination of the Contract'. There are 163 references.

This is a book that can be warmly recommended to students of psychoanalysis. Its value to others is not so obvious, and because of its candour, it may even be received unfavourably by those who have no first-hand experience of the subject-matter.

W. H. GILLESPIE

Topics in Psychiatry. Edited by T. FERGUSON RODGER, R. M. MOWBRAY and J. R. ROY. Cassell, London. 265 pp., 20s.

THIS book is remarkably good value, both intellectually and financially—indeed outstandingly so in the latter respect. The plethora of edited symposia of conferences which have appeared over the past few years makes the reader wary of yet another, but in this book we are spared the embarrassingly full transcribed record, with all the inanities, and poor grammar that too often emerges from the mouths of men who should know better. This book, properly edited, is a solid contribution from the Glasgow school of psychiatry. Areas of psychiatry were chosen for the discussion in which changes of outlook had occurred, schizophrenia, psychosomatic medicine, tranquillizing drugs and mental deficiency. The psychosomatic section is most competently dealt with; S. A. BARNETT for instance contributes a chapter on animal behaviour and its relevance to the problem under discussion, whilst there is a

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brief review by KISSEN of the work which forms the substance of his monograph on pulmonary tuberculosis. The Glasgow school can justly be proud of the steady, solid work being achieved by its members in all the spheres of activity dealt with by this conference. The ephemeral nature of many similar reports of symposia is far from being the case here—it is, and will continue to be, a most useful book.

DENIS LEIGH

A. P. NOYES and L. C. KOLB: **Modern Clinical Psychiatry** Fifth Edition. Saunders, Philadelphia, 1958. ix + 694 pp., 56s.

THIS is the fifth edition of this popular American textbook of psychiatry, and Dr. LAWRENCE C. KOLB has joined with Dr. NOYES in refurbishing and bringing its contents up to date. The result is in many ways excellent, although as in any book such as this criticisms can be made. For instance, few in this country would regard 20 E.C.T. as the usual course of treatment in depressive states, or would agree that modified analytically oriented interviews may prevent or modify attacks. Likewise, the index is poor—suicide for instance does not occur in it; on the other hand each chapter is followed by a most skilfully chosen bibliography. The style of writing and the production of the book are most pleasing, whilst the price is reasonable. The book remains by far the best American textbook of psychiatry.

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Symposium on Information Theory in Biology. Edited by H. P. YOCKEY, R. L. PLATZMAN and H. QUASTLER. Pergamon Press, London, 1958. xii + 418 pp. 80s, 12$.

THIS volume contains some forty papers which collectively expound a recently-developed mode of expressing mathematically, aspects of the order and organization of living things. Many of the papers appear to be considerably elaborated beyond the form in which they were presented at the 3-day Symposium in 1956 from which they originated. Thus some incorporate discussion then engendered, while H. QUASTLER's introductory account is in the form of a brief 'Primer on Information Theory', well presented and with numerical questions and answers. This is valuable to a worker entering the subject; the book as a whole is well-produced and sympathetically planned in this regard, having a good index which leads the novice to the appropriate sections for definitions of 'bits', 'white noise' and other terminological curiosities which reflect the contributions made to information theory from communications engineering.

Apart from its introduction and brief final discussion, the book is arranged in five sections of which the first, 'Storage and Transfer of Information,' largely concerns the genetic conditioning of protein synthesis, ultimately by the nuclear deoxyribonucleic acid. This fundamental problem is first presented by H. P. YOCKEY, G. GAMOW and M. YČAS as one of transfer of information from a four-letter to a twenty-letter code. It is regrettable that the presentation introduces a number of extraneous entities, as spades, workmen, foremen and diamonds, but does not illustrate the structure which is being formed: the peptide linkage, or the structural formula of a simple polypeptide or of part of a protein molecule would give greater contact with reality. Much other information about proteins is, however, given and is analysed from the point of view of the way in which nucleic acids condition protein structure. Such statements of the criteria imposed by information theory on protein synthesis give valuable impetus to the further chemical study of nucleic acids and proteins: and these studies, it is to be noted, are already suggesting that each type of nucleic acid contains more bases than the four which featured in the first applications of information theory to this problem.

In the following section on 'Determination of Information Measures', QUASTLER's contribution is an attractive essay on scientific methodology in which it is suggested that qualitative or semi-quantitative applications of information concepts may form their most important contribution to biology. This outlook the present reviewer has accepted in justification of his appraising the book with minimal attention to many of its more mathematical parts. In this section, H. QUASTLER, B. N. JAROSLOW and P. D. KLEIN are concerned with evaluating coenzyme and antigenic specificity

in terms of information measures. Two sections follow concerning 'Destruction of Information by Ionizing Radiation' and 'Aging and Radiation Damage'.

The final section on 'Information Networks' contains two attractive approaches to problems of development. M. EDEN is concerned with the early stages of cell division, and how asymmetry may first be introduced in the growing embryo. J. R. PLATT's account of mosaic receptors is probably that most immediately relevant to readers of the *Journal of Psychosomatic Research*. There is expounded the phenomenon of scanning in vision, in which the eye makes involuntarily a series of fine tremors and flicks. This has the effect of converting a space-pattern into a series of partly-repeated time-patterns: repeated, however, by different retinal elements so that the pattern becomes independent of variations in their sensitivity, and also achieves greater accuracy than would be possible in a static system. Shapes are then perceived by regularities in the order of recurrence of signals, rather than by the excitation of a fixed system of cells on the retina or visual cortex. It is proposed that the recognition of significant regularities in the series of signals can depend on characteristics of excitation of connecting neurons, and must be learned in the first years of life. Information theory indicates that to specify particular neural connexions between individual retinal elements and individual cortical cells would require more information than could be represented on all the chromosomes; consequently their initial connexions must be either random, or dependent on the visual signals actually received during development.

The book is to be praised for the variety of knowledge which its contributors bring to bear on biological questions. Often these items individually are not novel, but their apposition in a new context is refreshing: 'every kind of structure and process has its informational aspect'.

H. MCILWAIN

Homosexuality. Edited by C. BERG and A. M. KRICH. Allen and Unwin, London, 1958. 415 pp., 30s.

THIS book presents a selection of articles, formerly published in different periodicals and books. The purpose of the book is, by grouping contributions of several orientations, to come to a broad view on the causes, manifestations and therapeutic possibilities in homosexuality. In part 1 the inner meaning of homosexuality is illustrated by autobiographical and first-hand accounts of homosexual concerns and conflicts. Part 2 presents different viewpoints with regard to the causes, genesis and treatment of homosexual trends and behaviour. The psychobiological approach is represented by a contribution from M. HIRSCHFELD and a report of C. HAMBURGER, G. K. STYRUP and E. DAHL-IVERSEN on the treatment in a case of transvestism. Environmental influences are stressed in the contributions of SCHWARZ and GLOVER. The psychoanalytical concepts of psychogenesis are put forward by FERENCZI, SCHILDER, HAMILTON, BERGLER and THOMPSON, while accounts of analytical treatment are given in case-reports by FREUD, JUNG, FLOURNOY, BRODY and WULFF.

By virtue of its rich clinical material, supported by the theoretical views of important figures from the major schools of thought on the subject, the book gives an excellent survey of the different aspects of homosexuality. Moreover, although a definite answer to the question: 'are homosexuals born or made?' cannot be given, eclectic articles by G. W. HENRY and G. S. SPRAGUE and especially the editorial survey of CHARLES BERG form a basis for evaluating the relative importance of inherited and acquired factors.

The book is an important contribution to the understanding of the homosexual manifestations occurring within the framework of human sexual life.

R. A. PIERLOOT

F. REDL and D. WINEMAN: **The Aggressive Child.** The Free Press, Illinois, 1957. (575 pp., $7.50)

THIS is a re-publication in one volume of *Children Who Hate*, published in 1951, and *Controls from Within*, published in 1952. After preliminary experience elsewhere the authors set up Pioneer House in 1946, as an experimental "group therapy home" for the residential care of a small group of severely disturbed and aggressive pre-adolescent boys of normal intelligence. *Children Who Hate* describes the backgrounds from which these boys came and analyses the sort of disorganization

and breakdown of controls that they showed. *Controls from Within* gives the methods of treatment used until the project came to an end in 1948. 'Pioneer House' was 'not an institution with built-in psychiatric services, but a residential setting with a total treatment design'.

Those, who take on the care of such children, can learn much from this book on the kinds of behaviour likely to be met and the therapeutic techniques helpful for their day-to-day handling. It is, therefore, a disadvantage that the style of writing is colloquial and rather long-winded. Again, purists are likely to disagree with the authors' exposition of ego psychology. However, their methods appear to be sound, with the achievement of security by well-directed liberal control and in this setting, effective treatment can be brought about through the insightful handling of incidents as they arise. The value of their work is appreciated, when the difficulties of treatment of such children have been experienced, while the probable importance of a successful outcome for the future stability of these children needs no reminder.

W. WARREN

A Comprehensive Dictionary of Psychological and Psycho-analytical Terms. A Guide to Usage. HORACE B. ENGLISH and AVA CHAMPNEY ENGLISH: Longmans, Green, New York, London and Toronto, 1958. pp. 594, 60s.

THIS is an excellent dictionary which psychologists and psychiatrists alike will find useful. Handy in size, extremely well produced and printed, it is a mine of information. Every psychiatric term coming to mind over the period spent browsing in this dictionary (for how else can a dictionary be read?) was identified, and the meanings found eminently satisfactory. The relatively unsophisticated psychiatrist will obtain much information about the terms used by his more sophisticated psychologist colleague—for one psychiatrist already the dictionary has solved some complicated problems of psychological terminology. Some 13,000 terms are included, and special attention is given to pronunciation, lay and technical meanings, and semantic and lexical difficulties. It is always possible to disagree with some definitions, or with the inclusion of some words, but the authors have produced a valuable and most useful book.

DENIS LEIGH

Exploration in Social Psychiatry: Studies in the Interplay of Personality Development and Social Forces. Edited by ALEXANDER H. LEIGHTON, JOHN A. CLAUSEN and ROBERT N. WILSON. Tavistock Publications, London, 1957. pp. 452, 40s.

APPROPRIATELY, this book is the product of group interaction. After two conferences in which leading American psychiatrists and sociologists took part, a Committee on Research in Psychiatry and the Social Sciences was formed, with two main areas of study: (1) A review of concepts and methods relevant to understanding the nature of mental health and disease viewed as processes that have both individual and group aspects, and (2) the definition of areas that invite research attention. Certain topics were chosen to serve as "portals of entry" into discussion of the interplay of personality processes and social processes. It was hoped that by starting on the one hand with individual cases of mental disorder and on the other, with group processes, it might be shown how social and individual dynamics were merged and that the several paths followed from various portals of entry would "enrich the psychiatrist's perspective by considering individual pathology in a social fabric and enhance the social scientist's outlook by revealing social patterns in the dramatic immediacy of a case history".

The resulting volume consists of a series of contributions in which a number of workers report their findings within the framework of the relevant literature. First, we are introduced to the mentally ill individual: Prof. TYHURST writes on paranoid disorders; KUBIE re-states his theory of the Neurotic Process and discusses its relationship to social forces; HINKLE and WOLFF report some of their results of Studies in Human Health and the Ecology of Man conducted from the New York Hospital-Cornell Medical Centre, while REDLICH introduces the question as to what is meant by the concept of Mental Health. Then there are three chapters on shared mental illness. CLEVELAND

and LONGAKER write on neurotic patterns discovered in families encountered in the course of the Stirling County Study conducted by Cornell University. GRUENBERG reviews the subject of *folie á deux* under the heading of "Socially Shared Psychopathology". One of the editors, CLAUSEN, reports on the relationship between adolescent drug use, social patterns and personality. There is one chapter by MICHAEL on the effect of bereavement on mental health which leads over to the discussion of the relationship between mental illness and society under three chapter headings: LEACOCK reviews ecological studies with special reference to the Rural–Urban, the Nationality and the Socio-Economic variables. GRUENBERG and BELLIN describe the impact of mental disease on different societies, and LEIGHTON and LONGAKER report on the reactions produced by introducing for the first time a psychiatric clinic into a community during the Stirling County Study.

The only chapter of immediate interest to the psychosomatic reader is that by HINKLE and WOLFF in which they describe an experimental investigation into the relationship between health in the widest sense of the word and the social environment. They start from the assumption that attempts of man to adapt to his social environment may be associated with fluctuations in his health, but state that it is not known whether only some types of disorder may occur, whether they may only be psychological, or also physical, or to what extent different kinds of diseases may be interrelated. Having pointed out the limitations of short-term observations under laboratory conditions, the authors describe a new research during which they and their team of workers investigated the members of three samples of population in order to ascertain what illnesses they had experienced and under what circumstances. We cannot here describe in detail the principles and methods of selection employed in obtaining two reasonably homogeneous samples of American employees of a large firm and one group of upper class Chinese immigrants; nor will we recapitulate the methods used in obtaining and correlating the subjects' life and medical histories, except to say that much thought was given to avoid obvious and less obvious sources of error. The main finding so far reported was that in spite of the homogeneity of each group in terms of equal exposure to various agents known to be causative of disease, some individuals showed a far higher incidence of disorders than could be explained by chance. Moreover, the investigators discovered that people having the greater number of illnesses experienced a wider variety of them in a number of body systems; furthermore, these people also suffered a greater number of disturbances of mood, thought and behaviour. There was then in all three groups a parallelism between the occurrence of psychoses, psychoneuroses and bodily illnesses; psychosomatic conditions are included in the lists of disorders encountered, but are not treated separately in this communication. The second point is that illnesses were found to have occurred in clusters along the life line during periods when the individual was having difficulties in adapting to the configuration of his life. While hereditary and constitutional characteristics might well explain why some people develop many, and others few illnesses, the phenomenon of clustering was held to be due to changing life stresses. The workers report their findings in a much more tentative fashion and refrain from giving statistical details, when reporting that there was a tendency for people with most illness clusters to have come from more disrupted family backgrounds and to have suffered from more interpersonal difficulties during their adult lives. From a study of individual subjects, the authors believe to have discovered that very often minor stresses, as viewed "objectively" by the outsider, had produced major physical or psychological illnesses, while the opposite had often been the case in relation to stresses which to the investigator seemed to have been severe. They conclude "that illness often occurs when an individual perceives his life situation as peculiarly threatening to him, even though this life situation may not appear to be threatening to an outside observer; and that people who maintain good health in a setting of what are 'objectively' difficult life situations do not usually perceive these situations as difficult". The healthiest subjects were not always those with a generally superior adaptive capacity, but rather people who had existed in life situations (e.g. unmarried women of one sample) which were objectively unfavourable, but which satisfied their own peculiar needs and aspirations. By contrast, increased susceptibility to all forms of illness was often found in people attempting to adapt to life situations which did not fulfill their needs, frustrated their aspirations and placed heavy and conflicting demands upon them.

In this review it is not possible to discuss the other chapters of this book. There is only one critical submission to be made: many contributions seem too long, largely because statements tend to be repetitive with verbiage, concerning the obvious, hiding from view the essential and important. Fortunately, there is always a lucid and integrating discussion after each chapter by the three Editors, who also re-examine the main issues in a final chapter.

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A recurrent theme of the book is a preoccupations with the borders between mental normality and psychiatric illhealth. After REDLICH's lucid and scholarly account of the conundrums puzzling people who attempt to define these borders, the Editors suggest some ways out of these difficulties. "In order to develop treatment services for all persons who deviate markedly from a state of health, it is necessary only to be able to specify the patterns of illness and degree of impairment which will qualify persons for treatment". But LEIGHTON, CLAUSEN and WILSON go on to point out that in any study of the relationships between social and cultural conditions, and mental health, it will be necessary to distinguish between degrees of health and illness; the same holds for the relationships between mental health and interpersonal functioning, and for the institution of early treatment. The Editors declare themselves in favour of by-passing the problem for the time being: they suggest that starting from symptom clusters, their distribution in different cultures and different social classes should be determined and compared, and they feel that with the present rapid development of the behaviour sciences measurements of these sympton patterns have become possible. Once the distribution of these patterns has been determined, their appropriateness and degree of resulting impairment within the various social and cultural contexts can be determined and measured.

On the other hand, LEIGHTON, CLAUSEN and WILSON are discouraging when they finally lay down the conditions which must be fulfilled before the present lag of psychiatric research as compared with other sciences may be lessened. In their opinion the complex problems of social psychiatry can only be investigated adequately by interdisciplinary co-operations between psychiatrists with nosological orientations, psychiatrists with analytic–dynamic outlook, public health psychiatrists with ecological and statistical starting points, as well as with social scientists having various foci of interest and experience. Moreover, in view of the notorious difficulties in retrospective anamnestic evaluations, investigations would have to follow subjects over considerable periods of time.

In the reviewer's opinion, this stipulation of interdisciplinary research is unlikely to be satisfied, but smaller groups of investigators with related outlooks will be well advised to familiarize themselves with what is going on in neighbouring disciplines. Certainly, this book, with its 24 pages of bibliography, gives a comprehensive and critical account of the present status of Social Psychiatry, and can be warmly recommended to post-graduate psychiatrists of all orientations.

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ANNOUNCEMENTS

Prize for Clinical Research in General Practice

Through the generosity of the Sir Halley Stewart Trust the Society for Psychosomatic Research will be offering two prizes of £50 each for a paper reporting original research within General Practice on some aspect of psychosomatic medicine. Details can be had by writing to the secretary of the Society at 96 Portland Place, London, W.1.

Revue de Médecine Psychosomatique

The first issue of a new quarterly journal, *Revue de Médecine Psychosomatique* has appeared. Further details may be obtained from Les Editions de Médecine Pratique, 12 Rue Pierre-Geofroix, Colombes (Seine), France.

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J. Psychosomatic Res., 1960, Vol. 4, pp. 149 to 175. Pergamon Press Ltd. Printed in Northern Ireland

BODY TEMPERATURE AND PULSE RATE IN BOYS AND YOUNG MEN PRIOR TO SPORTING CONTESTS. A STUDY OF EMOTIONAL HYPERTHERMIA: WITH A REVIEW OF THE LITERATURE

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INTRODUCTION

THE expression "psychogenic fever" is fairly new. However, a link between the passions and body heat is a concept at least as old as the humoral doctrine itself. Since the quantity or quality of phlegm (cold and moist), yellow bile (hot and dry), blood (hot and moist) and black bile (cold and dry) varied in different bodily constitutions and at different periods of life, it naturally followed that the heat of the body also varied. "When there is an overflow of the bitter principle which we call yellow bile," said Hippocrates, "what anxiety, burning heat and loss of strength prevail." In the "Phaedo" Plato tells how Socrates was advised to keep silent before swallowing the draught of poison, thus allowing it to act quickly, because, it was added, "people get hotter by talking". "Passions", noted Aristotle, "produce heat . . . so the fibres that are solid and earthy become as it were embers inside the blood, and cause it to boil when fits of passion come on." This was to be expected, since the heart was believed by many to be the seat of the "innate heat" as well as of the emotions. "In those who are angered, or disturbed or ashamed", insisted Galen, "an increase in the natural heat also occurs. But anger is not simply an increase of heat but a boiling of the heart . . .Anger, weeping, rage, sadness and excessive worry and great watchfulness arising from these kindle fevers." The Methodist physicians believed that not only a damp or cold air but also violent emotions could produce fevers, by blocking the skin pores and thus preventing the escape of insensible perspiration ("adelos diapnoe" or "perspiratio insensibilis"). As to the pulse, it was well known by the Greek and Roman clinicians that this was increased or irregular in the presence of violent passions.

These various ideas continued unabated into the middle ages, and later. Johann LANGE (1554) wrote on the "love fever", "white fever" or "morbus virgineus", a condition probably identical with chlorosis. In 1614, SANCTORIUS, by weighing the body under various conditions, gave a stamp of authority to the old idea that violent emotions, by blocking the exit to the "matter of perspiration" (insensible perspiration), caused fevers and most other ills of the flesh (RENBOURN, in press). This new "Methodism" was to continue until almost the end of the 19th century. Confusion between emotional disorders and infective fevers is seen in the "English Spleen and Vapours" of BLACKMORE (1725), the "English malady" or "Slow Cold or Nervous Fever" of CHEYNE (1734) and the "Febricula . . . or Hysterical Fever" of MANNINGHAM (1746). POMME (1765) described a "fièvre spasmodique" in hysterical women. During this period a few clinicians (Martine, de Haen, Astruc, Currie, etc.) made

* From the Ministry of Supply.

use of a thermometer at the bedside, but the diagnosis of fever was generally made with the hand or eye alone. Until the beginning of the 17th century the word thermometer was hardly known, and "temperature" used to mean a due measure or proportion rather than a degree of heat.

ANDREW COMBE (1834) noted that "... some mental conditions operate on the skin ... and at the same time diminish perspiration and nervous action; whilst rage and other violent passions, by augmenting the afflux of blood, elevate the temperature of the surface." JOHN DAVY (1839) found that brain work raised the body temperature as measured by a thermometer, and added that, "taking 98° as the standard", lunatics had a higher level. The expression "hysterical fever" continued to appear in the literature, but it was generally believed to arise from organic disease (of the uterus, ovaries, stomach, etc.) or from the heat produced during the convulsions. "Nervous fever" continued in use as a vague expression to mean, amongst other things, meningitis and inflammation of the brain.

BRIQUET (1859) classified the varieties of "hysterical fever", but apparently did not measure body temperature. Lombroso, Broca, Sequin and Mosso continued the concept that brain work caused a measurable rise of body temperature, but this was disproved by ALBUTT, 1898. In 1871 WUNDERLICH noted that in the vaso-motor neuroses—"which are by no means thoroughly understood as yet"—the body temperature could be raised. Charcot, and later DÉJERINE 1914, described "neurasthenic fever" —perhaps the precursor of "psychogenic fever". Early reviews on the latter were published by TUKE (1872), SARBO (1892), FERÉ (1899), VON VOSS (1906) and KAUSCH (1907).

It was assumed from earliest times that animal heat was greater in children. With the aid of a thermometer, investigations on the matter were carried out by DE HAEN (1760), DAVY (1814), ROGER (1844), FINLAYSON (1868) and RAUDNITZ (1888) etc., but because of lack of control and technical errors the data have little more than historical interest.

PRESENT INVESTIGATION

The purpose of the present study is to put forward controlled data on the effect of emotional stress present before competitive sports (boxing and field athletics) on the resting body temperature and pulse rate of schoolboys, youths and young men.

For several months (from October to April) the writer was medical officer to a school boxing club consisting of about 32 boys from 12 to 14 years of age. Home boxing matches were held at about 7.30 p.m. in the school hall, with boys of the same age group from other schools in the area. During the season the club held training sessions, roughly once a week, about the same time of the evening, with a period of 30 minutes of fairly standardised exercises sufficient to produce generalised sweating. Boxing matches took place about once a month. A bout consisted of the usual three rounds of one and a half minutes, with rest periods of two minutes.

During the first match of the season, as part of a simple clinical examination, the oral temperatures (sublingual, 5 mins), pulse rates (one min) and heights of the young boxers were taken in the standing position after weighing-in. No strenuous muscular activity had been done before or after arrival at the hall, no food or drink had been taken for an hour or more, and boys had been standing about chatting and bickering for about 30 minutes before examination. As expected, pulse rates were

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somewhat raised; the oral temperatures, however, were unexpectedly high, with figures of 99·4–100·6°F in 9/11 boys. No local or general cause for this slight "pyrexia" had been found and, since the boys were fit by subjective clinical standards, it was decided to let boxing proceed. The N.P.L. clinical thermometers were later checked for accuracy, but were found to conform to accepted standards. It was by then suspected that the elevated temperature might be of a psychological origin, and an investigation by a team of observers was arranged on the following lines.

(1) Since further knowledge of "normal" temperature and pulse was required, a control group of boys (12–14 years old) was examined during school hours. Unfortunately this could be done only at about 4.30–5.15 p.m. The headmaster and the boxing master alone knew of the impending visit. Groups of about 40 boys walked from the classrooms into the hall (a distance of 20–30 yards), the purpose of the visit was explained in a simple way and recordings of oral temperature (5 min) and pulse (1 min) were taken in the upright position. In all, 116 boys were examined during a single afternoon in February.

(2) Boys attending training evenings at the club had oral temperature and pulse rate taken about 20–30 min before exercises, and where possible immediately after them.

(3) During the various boxing evenings of the season, one of which was a county event, boys of the home and visiting teams were clinically examined after weighing-in, and pulse and oral temperature were recorded. The skin of the trunk and limbs, axillae and palms was examined by the hand for warmth, dryness or sweatiness, and the size of the pupils given a simple subjective rating (viz. normal, enlarged). The boys were asked whether they felt cold, "ordinary" or warm. The boxers had not met their opponents and did not know them. Where possible pulse and oral temperature readings were repeated as soon as the boy had left the boxing ring, about 2–3 min after the end of a bout. 10–14 bouts were held during an ordinary boxing session, with about double this number during the county match. Boys of the audience, both from the school and from outside, of age 12–14 years had pulse rate and oral temperature taken at the same time, place, and conditions as the boxers.

(4) In order to obtain "psychologically basal" readings, a group of 15 volunteers from the school boxing club had oral temperautres (but not pulse rates) taken at home in the evenings at about 6.30–7.30 p.m., by the writer or by the boxing master or parents who had been trained to take readings accurate to 0·2°F. These readings were made in the upright posture and at least half an hour after food or drink. No recording was made for two days before a boxing match or training evening.

Examinations before training and boxing were carried out between 6·30 and 7·15 p.m. and under the conditions obtaining at the first boxing evening. Boys were dressed in jackets and trousers over their vests and shorts. Oral temperature (sublingual 5 min) and pulse (1 min) were taken.

(5) During the above investigation, opportunity offered itself on two consecutive evenings for a similar study of amateur boxing on 24 young men and 21 controls (soldiers aged 19–25 years). Examinations were carried out before boxing as explained above. In addition, boxers had blood pressure taken while sitting, and had urine examined for glucose. It was not possible to take measurements after boxing.

(6) During the month of August an investigation on two consecutive afternoons was carried out on 69 athletes of various field events, and on 83 members of the audience consisting of boy soldiers (age 15–18 years). Pulse rate and oral temperature, together with height and weight of the athletes, were taken as before, at the same time of the afternoon, about 30–60 min before the events and before any "warming up" by the athletes. Measurements were carried out in a large, well ventilated tent which had dry and wet bulb temperatures of about 80°F and 71°F, respectively, on both afternoons. The athletes were dressed in track suits.

An informal atmosphere was maintained during all periods of study, in the hope of minimising any mental stress arising from the examination itself or from the presence of observers. Controls were examined under the same conditions as boxers and athletes. Indoor temperatures varied between about 62° and 66°F.

Although not all the boys of the club attended each training evening and the school team presented on boxing evenings varied somewhat, sufficient data were collected for variance analyses on the same groups of boys. Where different groups were compared, the "t" test was used. Because of the absence of full control over experimental conditions, the results from the various analyses should be regarded as qualitative rather than strictly quantitative. A number of correlations, regressions and frequency distributions of interest were calculated.

RESULTS

A. *Boys Examined in School*

The results are summarised in Table 1.

TABLE 1.—ORAL TEMPERATURE AND PULSE OF 116 BOYS (12–14 YEARS OF AGE) EXAMINED IN SCHOOL

	Mean ± S.E.	S.D.	Range
Temp °F	98·99 ± 0·06	0·65	97·0–100·2
Pulse/min	88·30 ± 1·4	14·80	60–128

The "normality" of the boys cannot be vouched for, since they were not examined clinically, and were seen on one occasion only; but there is no reason to suspect that they were anything but a typical group of schoolboys. For a week after the investigation none was absent from school. The mean and the range of pulse rate given in Table 1 were those expected under the circumstances, but it was not anticipated that oral temperatures over 99·0 °F would be found during the winter months. The object of this part of the investigation was to examine the boys under what was then considered to be "psychologically basal" conditions, but it was soon obvious that two rumours were circulating during the examination itself: (a) that the observers had come to carry out "tests to prove which of the boys smoked" (origin, boxing master); (b) that the observers were going "to bleed the boys of one or two pints of blood" (origin, boys).

On the arbitrary assumption that the maximum "normal" resting temperature and pulse are 99°F and 90 per minute respectively for boys of 12–14 years, the following table was derived from the data.

TABLE. 2.— FREQUENCY OF RESTING ORAL TEMPERATURE AND PULSE OF 116 BOYS IN SCHOOL

Temperature					Pulse				
<99 °F	≥99 °F	≥99·5°F	≥100 °F	≥101 °F	<90/min.	≥90/min.	≥100/min.	≥110/min.	≥120/min.
36·5%	63·5%	22·0%	3·5%	0·0%	60%	40%	21·7%	12%	5%

It would appear that a "raised" temperature occurs more frequently than a "raised" pulse.

It was of clinical interest to discover whether a raised temperature is associated with a normal pulse or *vice versa*. Taking all with temperatures of 99·5°F and above, 13/26 (or 50%) had a pulse of 90/min or below. The following are typical examples:

100·2°F/80; 100·1°F/63; 100·0°F/76; 99·9°F/82; 99·8°F/88; 99·8°F/82; 99·6°F/90; 99·6°F/84

Similarly, 4 of those with a temperature of 98·4°F and below (27/116) had a pulse of over 90/min. Typical examples are:

97·6°F/112; 98·0°F/96; 98·1°F/100; 98·4°F/100

The correlation coefficient of oral temperature to pulse rate in the above data was $r = 0{\cdot}233$ ($p < 5\%$). This corresponds to the findings given above.

B. *Investigation on School Boxing Club*

Data from training evenings

1. *Pre-training.* Analysis of variance was carried out on the "resting" (pre-exertion) temperature and pulse of a group of the same 13 boys for six different training evenings. A highly significant ($p < 0{\cdot}1\%$) "boy to boy" difference was found for both temperature and pulse rate, which suggests that each boy has his own particular level. A highly significant "between evenings" difference was found for oral temperature ($p < 0{\cdot}1\%$), but not for pulse rate.

Examination of the mean oral temperatures (Table 3) suggested that a downward

TABLE 3.— MEAN PRE-TRAINING ORAL TEMPERATURE AND PULSE RATE (13 BOYS ON 6 EVENINGS)

Training Evening Number	Temperature °F						Pulse/min.					
	1	2	3	4	5	6	1	2	3	4	5	6
Mean	99·08	99·22	98·78	98·61	98·85	98·31	94·0	89·8	93·1	94·5	89·8	89·2
S.E.	0·14						2·4					
Range	96·8–100·0						60·1–120					

trend with time might be present. Regression analysis was carried out to test this. A highly significant fall in temperature over the six evenings was found ($p < 0{\cdot}1\%$). Since other variables affecting body temperature, e.g. room temperature, outside temperature (See Additional Statistical Data of Interest), could be regarded as random disturbances, the probable cause of such a trend is something intrinsic in the group of boys. After the first training session, the boys knew each other and the evening routine increasingly well, and the element of competition during training periods was negligible. A reasonable explanation of the downward oral temperature trend is acclimatization to the known emotional stress of meeting and being examined in a group.

If it is taken into consideration that oral temperature at 7 p.m. is likely to be slightly higher than at 4 p.m., the mean pulse and oral temperature for training evenings Nos. 1 and 2 (Table 3) does correspond to that found in the boys examined during school hours (Table 1). It is reasonable to assume that confronting a group of boys with an unusual situation, such as the presence of doctors and the recording of temperature or pulse rate, may itself quickly raise the oral temperature. However, it is possible that the raised temperature may have been present before the boys left the classroom.

The mean of all pre-training figures (140) collected over the boxing season were: oral temperature 98·75 ± 0·06°F (range, 96·5–100°F) and pulse 93·2 ± 1·1 beats/min. (range 60–140). Some of these figures were obtained from boys who attended only one

or two evenings. Calculation of the correlation coefficient of pulse and oral temperature for these data gave $r = 0{\cdot}244$ ($p < 5\%$), a figure similar to that obtained for boys examined in school hours.

2. *Post training.* For the purpose of this study it can be assumed that the intensity of exercise during a training session was approximately the same from one evening to another. A large number (99) of paired temperature readings (before and after training) were available for the same 27 boys over 5 different evenings. The majority of means (Table 4) showed a negligible rise of temperature during the training period.

TABLE 4.—MEAN CHANGE IN ORAL TEMPERATURE OF 27 BOYS WITH 30 MINUTES TRAINING (5 EVENINGS)*

Training Evening No.	Temperature °F				
	1	2	3	4	5
Mean ± S.E.	0·07 ± 0·15	−0·09 ± 0·15	0·04 ± 0·16	0·06 ± 0·17	0·11 ± 0·16
Range	2·3 to −1·8				

* None of these results was statistically significant.

This result suggests that the relatively high mean oral temperature found in school hours (Table 1) is not likely to be due to the muscular exertion of leaving the classrooms. Since few observers were available, routine post-training pulse rates could not often be taken. However, on evening No. 1, 17 boys had pulse rates taken before and after the training exercise. Analysis of the results gave: mean change, +16·1 beats/min ($p < 0{\cdot}1\%$), range from +56 to −4 beats/min, which shows that although the 30 min exercise produced a negligible change in oral temperature, an appreciable rise in pulse rate does occur.

Data from boxing evenings

1. *Pre-boxing.* Most of the 150 boys examined over the period of the boxing season looked somewhat pre-occupied except when held in conversation.

In general, pupils appeared to be somewhat dilated compared to controls, the trunk warm, the limbs cool, and the whole body dry except palms and axillae which were damp or sweating. Some degree of "goose skin" on the trunk or limbs was common, and this could not be ascribed to exposure during examination. In any case, the responses to the questionnaire was "ordinary" in about 75% of cases, the rest being equally "warm" or "cold". Shivering was not observed in any of the boys. There is no obvious relationship between body height or weight and either pulse rate or oral temperature nor between the latter two and the subjective findings. Thus most boys with temperatures of 100–101°F said they felt "ordinary". Again there was no relationship between pre-boxing pulse rate or oral temperature and the degree aggressiveness during boxing.

Repeated examinations of the same individuals could be made only on boys of the school club. Six were chosen from whom data for oral temperature and pulse rate were available for the same boxing evenings during the season (6 evenings for temperature, 5 evenings for pulse). Variance analysis showed a highly significant ($p < 0{\cdot}1\%$) difference between boys for both pulse and temperature. This result is identical with that found for the pre-training data. As with the latter, the "between evenings" difference was significant for temperature ($P < 5\%$) but not for pulse rate.

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Examination of the mean pre-boxing oral temperature for the various evenings (Table 5) showed no obvious trend, and this was confirmed by regression analysis. Since this result could have been due to different trends for the separate boys, the individual temperature curves of the 6 boys were separately examined, again with a negative result. One may conclude that in the face of the stress of waiting to box an unknown opponent, acclimatization does not occur in the pre-boxing temperature. This is in contrast with the findings on the training evenings. Because of the negligible

TABLE 5.—MEAN ORAL TEMPERATURE °F AND PULSE RATE/MIN OF 6 BOYS ON VARIOUS EVENINGS

Boxing Evening No.	Temperature °F						Pulse/min				
	1	2	3	4	5	6	1	3	4	5	6
Mean	99·76	99·53	99·97	99·59	99·22	99·60	92·7	97·0	90·7	93·0	86·7
S.E.	0·14						3·4				
Range	98·1–101·0						64–110				
Significance	Evening No 5 < rest; $p < 5\%$						Not Significant				

rise of temperature occurring with training exercise, it can be accepted that the high means in Table 5 cannot be explained in terms of the gentle muscular activity of undressing and walking about which inevitably occurs before boxers are examined.

It may be of interest to give an example of data found during a particular evening. The following are figures of pre-boxing oral temperature and pulse rate for 10 boys of the boxing club obtained on evening No. 4.

99·8°/102; 99·4°/96; 101·0°/108; 99·7°/80; 99·5°/76;
99·4°/88; 99·5°/72; 100·2°/100; 100·1°/108; 98·7°/104.

The mean pre-boxing results for a total of 150 boys examined during the whole season (boxing club, visiting team and county championship) was 99·5 ± 0·06°F, S.D. ± 0·62°F (range 97·6–101°F) and pulse 93·5 ± 0·9, S.D. ± 9·6 per minute (range 66–124). The correlation of pulse to oral temperature in the whole data was $r = 0{\cdot}196$ ($p < 5\%$), not significantly different to the correlations already given.

2. *Post-boxing.* Boys included in this series boxed the regulation three rounds, after which all showed profuse sweating. Owing to the practical difficulty in taking measurements immediately after a boxing contest, these could not be made on all evenings. However, paired readings (before and after boxing) were available for the same 20 boys for 3 boxing evenings. Variance analysis of this data showed a significant difference ($p < 1\%$) between evenings for temperature but not for pulse. The mean changes are given in Table 6. Data obtained from 34 other boys examined on one occasion only are given in Table 7.

In all cases there is a marked rise in pulse (mean 47, maximum 78 per min) with rates reaching 160 per min or more. The oral temperature almost invariably falls, with a mean drop of about 1·0°F and a maximum of about 3°F (compare Table 4). However, much of this fall is an artifact, for boxers often breath heavily through the mouth for short periods, and the mouth is washed out with cold water between

TABLE 6.—MEAN CHANGE ORAL TEMPERATURE AND PULSE RATE OF 20 BOYS WITH BOXING (3 EVENINGS)

Temperature change °F			Pulse change/min		
Evening No.			Evening No.		
3	4	5	3	4	5
−1·23 ± 0·17	−1·10 ± 0·24	−0·64 ± 0·19	44·7 ± 4·0	50·2 ± 5·5	46·7 ± 4·5
Range	−2·60 to 0·4		Range	12·5 to 78	
$p < 0{\cdot}1\%$	$p < 1\%$	$p < 1\%$	$p < 0{\cdot}1\%$	$p < 0{\cdot}1\%$	$p < 0{\cdot}1\%$

TABLE 7.—MEAN CHANGE OF ORAL TEMPERATURE AND PULSE RATE OF 34 BOYS WITH BOXING (1 EVENING)

	Temperature change °F	Pulse change/min.
Mean ± S.E.	−0·96 ± 0·14	47·5 ± 2·5
Range	−3·2 to 0·5	10 to 78
Sig.	$p < 0{\cdot}1\%$	$p < 0{\cdot}1\%$

rounds. Sponging the skin with cold water may be a factor in the fall of oral temperature (see Discussion).

The correlation coefficients derived from the 54 boys were:

Temperature (before and after boxing) $r = 0{\cdot}485$, $p < 0{\cdot}1\%$
Pulse (before and after boxing) $r = 0{\cdot}281$, $p < 5\%$
Temperature to pulse (before boxing) $r = 0{\cdot}202$, $p < 5\%$
Temperature to pulse (after boxing) $r = 0{\cdot}026$, Not significant

The marked dissociation between pulse and temperature after boxing is shown by the last two coefficients. It is clear that oral temperature is useless as a measure of the muscular stress of boxing.

Comparison of pre-boxing data of school team and opponents

Since all boxing matches except the county championship were held in the school hall, the boys of the boxing club can be considered to have been on their home ground, whereas the visiting teams often had to travel long distances. Although the amount of muscular activity before the bout was of the same order for visitors as

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for the home team, it was considered that the mental stress between teams might have been somewhat different.

The membership of the home team varied slightly on different evenings, and its opponents (84 boys) were from seven different schools. Analysis of variance showed no significant difference in pulse rate or oral temperature between evenings or between the home team and opponents. The mean results are given in Table 8. If emotional stress with boxing is due mainly to the expectation of being confronted by an unknown opponent, the results are not unexpected.

TABLE 8.—MEAN PRE-BOXING ORAL TEMPERATURE AND PULSE RATES FOR 7 EVENINGS. HOME TEAM VS. OPPONENTS

	Temperature °F		Pulse/min	
	Home team	Opponent	Home team	Opponent
Mean	99·58 ± 0·07	99·49 ± 0·07	93·1 ± 1·3	94·4 ± 1·3
Range	97·6–101·0	97·6–100·8	64–120	68–140

Comparison of pre-boxing temperature and pulse rate with audience

From data collected over the season, temperature figures were obtained for 3 evenings from 60 boxers and 65 boys in the audience. In the case of pulse rate, readings were available for two evenings only from 46 boxers and 47 boys in the audience. Means are given in Table 9.

TABLE 9.—MEAN ORAL TEMPERATURE AND PULSE OF BOXERS AND AUDIENCE BEFORE BOUTS

	Temperature °F						Pulse/min			
Evening No.	3		6		7		3		7	
	Boxers	Audience	Boxers	Audience	Boxers	Audience	Boxers	Audience	Boxers	Audience
Mean	99·36	99·33	99·55	98·51	99·66	98·72	94·4	92·7	94·8	95·4
S.E.	0·13	0·12	0·12	0·12	0·11	0·12	2·5	2·3	2·2	2·4
Sig.	Not		$p < 0·1$		$p < 0·1$		Not		Not	

Variance analysis showed a significant difference in oral temperature for "between evenings" ($p < 5\%$) and "between boxers and audience" ($p < 0·1\%$). However, no significant results were obtained for pulse rate. The significant difference between evenings for oral temperature was undoubtedly due to evening No. 3, in which means for boxers and audience were identical. On this particular evening the local championship was being held in the school hall and excitement in the audience was very high. On the two other evenings, boxers showed a mean temperature about 1·0°F higher than the audience, the difference being highly significant. It may be concluded that compared to the boxers the audience has, in general, an appreciable lower oral temperature but not pulse rate. The mere expectation of an exciting event may on occasion produce as high a temperature in an audience as in the contestants.

Comparison of pre-boxing and pre-training data

Over the boxing season figures were available for 10 boys who trained on the same 5 evenings and fought on the same 3 boxing evenings. The means are given in Table 10.

TABLE 10.—MEAN PRE-BOXING AND PRE-TRAINING PULSE RATES AND ORAL TEMPERATURE

	Temperature °F		Pulse/min	
	Pre-Boxing	Pre-Training	Pre-Boxing	Pre-Training
Mean ± S.E. Range	99·90 ± 0·15 98·8–101·0	98·84 ± 0·11 96·8–100·0	93·9 ± 4·6 72–112	94·1 ± 3·6 60–140

The mean pre-boxing oral temperature is about 1·0°F higher than the corresponding pre-training figure. Variance analysis showed the difference to be highly significant ($p < 0{\cdot}1\%$). Differences in pulse rate were small and not significant.

Comparison of "basal" pre-training and pre-boxing oral temperature

From 15 boys who had "basal" oral temperature readings taken at home, 12 were selected who had data for more than 14 evenings. Unfortunately these were not always the boys for whom maximum pre-training and pre-boxing data were available. Table 11 gives individual results and Table 12 the means.

TABLE 11.—INDIVIDUAL MEANS ETC. "BASAL" PRE-TRAINING AND PRE-BOXING ORAL TEMPERATURE °F FOR 12 BOYS

Boy No.	"Basal" Temperature		Pre-Training Temperature		Pre-Boxing Temperature		Significance	
	Mean: n	S.E.: range	Mean: n	S.E.: range	Mean: n	S.E.: range	Pre-Training to "Basal"	Pre-Boxing to Pre-Training
1	98·12: 54	0·06: 97·0–99·0	99·10: 7	0·15: 98·6–99·7	100·1: 5	0·06: 99·9–100·2	$p < 0{\cdot}1\%$	Sig*
2	98·48: 17	0·05: 98·2–98·0	98·70: 4	0·26: 98·0–99·2	– –	– –	Not*	–
3	98·45: 42	0·06: 97·8–99·2	98·6: 7	0·18: 98·0–99·5	99·8: 8	0·13: 99·3–100·2	Not	$p < 0{\cdot}1\%$
4	97·72: 34	0·14: 96·7–99·1	98·5: 7	0·10: 98·0–98·7	99·1: 5	0·32: 98·0–99·7	$P < 5\%$	Not*
5	98·56: 28	0·05: 98·0–98·9	98·7: 4	0·22: 98·2–99·1	99·1: 7	0·21: 98·1–99·7	Not	Not
6	98·25: 60	0·03: 97·8–99·0	98·0: 6	0·29: 97·0–98·8	99·5: 5	0·13: 99·0–99·7	Not*	$p < 1\%$
7	97·54: 28	0·04: 97·2–98·4	98·9: 5	0·21: 98·2–99·4	99·4: 7	0·10: 99·2–99·8	Sig.*	$p < 5\%$
8	97·62: 20	0·10: 97·2–98·4	98·0: 6	0·33: 96·8–99·0	99·6: 6	0·18: 99·1–100·4	Not*	$p < 1\%$
9	98·60: 29	0·03: 98·2–98·9	98·8: 7	0·17: 98·1–99·4	99·1: 8	0·16: 98·3–99·7	Not	Not
10	98·43: 15	0·04: 98·2–98·8	99·3: 7	0·09: 99·0–99·7	99·9: 6	0·09: 99·6–100·2	$p < 0{\cdot}1\%$	$p = 0{\cdot}1\%$
11	98·68: 16	0·07: 98·2–99·2	99·3: 6	0·21: 98·8–100·0	100·4: 7	0·17: 99·5–101·0	$p < 1\%$	$p < 1\%$
12	97·55: 28	0·13: 96·7–99·1	98·2: 6	0·45: 97·0–99·5	99·4: 5	0·08: 99·1–99·5	Not	$p < 5\%$

Note: * With "students" two sample t tests, the assumption is made that the variances of the two samples are the same. For each boy, and for each comparison of "basal" to pre-training and pre-training to pre-boxing oral temperature, a comparson of variances was made by the 'F' test. Where variances were not significantly different, students t test was computed. In the presence of significant differences the Welch test was done. In 7 comparisons of means, the samples were too small for the Welch test and resort was made to the t test which, under the circumstances, is not strictly valid. In cases marked* the significance given can be accepted as valid, but not the probability value, which is hence not given.

Although the data in Table 11 are incomplete it appears that when oral temperatures are taken under the emotionally "basal" condition of home, mean figures corresponding to those given in text books are found. However, the range of values for all 15 boys is somewhat wider (96·7–99·4°F) than generally accepted for evening temperatures. It appears that in 7/12 boys the mild excitement before a training session is associated with mean levels no higher than those taken at home at the same time of the evening. In 3/11 boys the pre-boxing were not higher than pre-training temperatures, but in 4 boys the pre-boxing readings are about 2·0°F higher than "basal"

TABLE 12.—GROUP MEANS OF "BASAL" PRE-TRAINING AND PRE-BOXING ORAL TEMPERATURE °F (12 BOYS)

	Basal (371)	Pre-Training (72)	Pre-Boxing (69)
Mean ± S.E. Range	98·15 ± 0·12 96·7–99·2	98·68 ± 0·13 96·8–100·0	99·59 ± 0·13 98·0–101·0
Sig.	$p < 0·1\%$		

levels. Table 12 shows that the means for the three varieties of "stress" are highly significantly different and that emotional stress before boxing can produce a mean rise of about 1·4°F above the "basal" oral temperature. However, roughly one quarter of a group of schoolboys may not show such a phenomenon. On the assumption that oral temperature is somewhat lower in the afternoon than evening, one may assume, with some confidence, that the temperatures of boys taken in school hours (Table 1) were not "basal" and, like those of a boxing audience (Table 9), correspond somewhat to pre-training temperatures (6th evening). A reasonable conclusion from the various data analysed is that when a group of boys meet together, particularly for the first time, with or without additional excitement, a slight epidemic of "psychogenic hyperthermia" quickly develops. In two boys in whom temperatures were also taken at home for two evenings prior to boxing matches, the readings were appreciably higher than their "basal" data in both cases. If under controlled conditions a raised temperature can be regarded as a valid indication of underlying emotional stress, this finding would appear to indicate that a state of mild apprehension may be present for some days before a boxing match. It would be of interest to ascertain whether the diurnal temperature curve or only the evening temperature is affected.

C. *Investigation on Adult Boxers*

The results are given in Table 13.

It is noted that boxers show an oral temperature 0·5°F higher (significant) than the audience, but there is no significant difference in pulse rates. This result is similar to that found in the schoolboy boxers, but mean temperature and pulse levels are higher in the boys.

However, it is generally accepted that at 12–14 years of age, body temperature is but very little different from the adult level, but this may be true only for "psychologically basal" conditions. It

TABLE 13.—PRE-BOXING DATA. ADULT BOXERS AND AUDIENCE

		Oral temperature °F	Pulse rate/min	Blood pressure S	Blood pressure D
Boxers (24)	Mean ± S.E.	98·90 ± 0·19	77 ± 2·4	150	78
	Range	96·8–100·0	60–104	110–190	50–100
Audience (21)	Mean ± S.E.	98·40 ± 0·13	80 ± 2·4	—	—
	Range	(97·5–99·2)	58–104	—	—
	Significance	$p < 5\%$	Not Sig.	—	—

would appear from our data that the same sort of stress may give a greater rise of oral temperature in children than in adults.

If one accepts 140 mm Hg systolic and 90 mm diastolic pressure as arbitrary limits of 'normality', 15/24 adult boxers had raised systolic, but only 1/24 showed raised diastolic levels (100 mm). The mean pulse pressure was raised. Such a result is known to occur in emotional stress (DUNBAR, 1946; ALTSCHULE, 1951). Scatter diagrams showed no obvious correlation between oral temperature or pulse rate and systolic or diastolic pressure. Urinary examination before contest showed absence of glycosuria in all cases. The adult boxers showed the same sort of skin responses as the boys, but to a less marked degree. There were no obvious pupillary changes.

D. *Investigation on Young Athletes*

Examination of Table 14 shows that the mean temperature of competitors before an event was 0·40°F greater (highly significant) than that of the audience. The

TABLE 14.—PRE-CONTEST ORAL TEMPERATURE AND PULSE RATE. ATHLETES AND AUDIENCE

		Oral temperature °F	Pulse rate/min
Athletes (69)	Mean ± S.E.	99·23 ± 0·05	85·50 ± 1·2
	Range	98·4–100	52–108
Audience (83)	Mean ± S.E.	98·82 ± 0·05	83·40 ± 1·2
	Range	97·6–99·4	62–104
Significance		$p < 0{\cdot}1\%$	Not Sig.

difference in pulse was small and not significant. This result is similar to that found in Table 13. Undoubtedly the relatively high mean oral temperature of both athletes and audience compared to adult boxers is due in part to the difference in weather conditions, since oral temperature may be appreciably higher in summer than in winter. The amount of the data warranted calculation of the correlation between pulse and temperature. This gave $r = 0{\cdot}220$ ($p < 5\%$), which corresponds well to that seen in the schoolboys.

E. *Additional Statistical Data of Interest*

Correlations were made between pre-training and pre-boxing temperature and certain weather conditions (evening temperatures, mean day temperature and humidity) on the day of activity and the day before. The coefficients were not significant. This suggests that the readings obtained were unaffected by outside weather, and that the assumptions made from the variance analyses are reasonable.

Regression coefficients of pulse rate on oral temperature were calculated for 6 separate groups of data (school group, pre-training, pre-boxing and audience, athletes and audience), where such calculation was warranted by the amount of data. The coefficients varied from $4{\cdot}3 \pm 1{\cdot}67$ to $7{\cdot}2 \pm 1{\cdot}74$; but, since a t test showed that they were not significantly different, they were combined to give a weighted mean coefficient of $5{\cdot}9 \pm 0{\cdot}90$. In simple language this means that with the oral temperature range found in the above data (96·8–101°F), an increase of 1°F in oral temperature was equivalent to a rise of 6 beats/min in pulse (with a variation of 4–7·5 beats per min.). This is the expected relationship in normal individuals during periods of mild stress (e.g. a clinical examination or before a sporting event). The result corresponds to that found by WHITING (1915–1917).

Examination of the data whose size warranted analysis showed, in general, that pulse distributions were Gaussian and temperature distributions non-Gaussian (Pearson I or IV).

DISCUSSION

Accepted beliefs die hard, even in the face of strong and repeated challenge. This is true for concepts of physiological normality (RENBOURN, 1949). During a century of clinical thermometry it has been accepted by physiological and medical text books that the "normal" resting oral temperature lies between 97°F and 99°F , above which a state of fever is said to exist. The findings of the present and other studies have shown a statistically significant difference exists between individuals for resting and post-exertional body temperature and pulse rate (REID *et al*, 1955; LEWIS and RENBOURN, 1955). From this it follows that a figure which is normal for one person may be abnormal for another. The existence of a diurnal variation in body temperature is well known, but it is not generally appreciated that between the hours of 7 a.m. and 2 a.m. a variation of as much as 3°F may occur in about 10 per cent of adults (RENBOURN, 1946). In the tropics the resting oral and rectal body temperature—but not the pulse rate—is raised in most individuals above that found in temperate climates, and oral readings (5 min) between 99°F and 99·6°F are common during the mornings (RENBOURN, 1946; CULLUMBINE, 1949; PORTER and GIBSON, 1951). On a warm summer morning in England, the resting oral temperature (5 min) lies between these limits in about at least 10 per cent of healthy young soldiers, but this value is very unusual during the winter (RENBOURN and DRAPER, unpublished data). The

effect of exercise on body temperature is recognised, but in the presence of external cooling (e.g. marching in the rain), the rise in rectal temperature is smaller, and the oral temperature may actually fall (RENBOURN, 1946). This phenomenon may play a part in the well marked fall in oral temperature after boxing that has been found in our data, since sponging the skin with cold water is commonly done between rounds. BURTON FANNING and GURNEY CHAMPION (1903) first described the effect of body posture on its temperature. This has been confirmed by KLEITMAN and DOKTORSKY (1933) and by RENBOURN and TAYLOR (1956). In rising from the horizontal to the upright position, the oral and rectal temperatures begin to mount within a few minutes, with a rise of at least 0·5–1°F. Hence in the absence of febrile disease, a person lying horizontally for some time shows a somewhat low body temperature. The temperature varies a little in different parts of the mouth, and the mean temperature below the tongue may be about 0·5°F higher than above it (LEWIS and RENBOURN 1955). A clinical thermometer will equilibrate within half a minute in a liquid, but it has long been known that this is not true for body temperature readings. There is still doubt about the period required for equilibration of a clinical thermometer in the mouth. (SHELLEY and HORVATH, 1946; MCDWYER, 1949; LEWIS and RENBOURN, 1955), but the factors concerned are not always taken into consideration. Under ordinary room conditions a cold thermometer may equilibrate almost as fast under the tongue as one warmed to 90°F. Where room temperature is 60°F or above, equilibration is virtually complete in 5 min (LEWIS and RENBOURN, 1955), but at 50°F or below this may take 10 min or more (RENBOURN and DRAPER, 1955) during which time the oral temperature may itself have changed. Morning oral temperatures (5 min) of 95–96°F are sometimes noted during the winter in normal people, but with a 10 min reading the level may have become raised by 1–2°F or more. The temperature below the tongue is not greatly affected by increasing respiration through the nose, but opening the mouth for a short period, as in speaking, causes an appreciable fall of the sublingual temperature with an increase in equilibration time, particularly in cold conditions. Although the above sources of error and variation in oral temperature are perhaps not of great clinical importance, they must be considered in physiological work and in conditions where small temperature differences are being investigated.

It may now be clear why physiologists sometimes look askance at the oral reading as a measure of internal temperature and, as a consequence, prefer to use the rectum. However, the rectal temperature is itself not above reproach. Almost a century ago BILLROTH (1862) pointed out that contraction of the external anal sphincter around a thermometer could produce local heat and raise its temperature. BENEDICT and SLACK (1911) and ABT (1919) showed that higher temperatures were obtained with a clinical thermometer placed as deep as possible into the rectum than when at more superficial levels. The differences were, however, ascribed to technical errors. On the other hand, MEAD and BOMMARITO (1949) and RENBOURN and TAYLOR have shown that, although under ordinary conditions there is no consistent temperature gradient in the rectum at the depth corresponding to the length of the scale of a clinical thermometer, the temperature is often 1°F or so lower in the pelvic part of the rectum (with a difference of up to 3°F in pigs). In a cold bath, a gradient of 2·2°F may occur within the length of the rectum. During horizontal rest and under conditions of "thermal equilibrium", temperature curves from different points of the rectum may cross each other for no obvious reason (except perhaps that of changes in blood supply). With rapid body temperature fluctuation in hot or cold exposure this phenomenon becomes well marked. Even with the aid of radiography it is not possible to specify the position of the bulb of a thermometer or the element of a thermocouple—whether just touching or compressing mucosa, whether free within the lumen or embedded in faeces. When

sublingual (mouth continuously closed) and rectal temperatures are taken simultaneously with thermocouples, the curves follow each other fairly faithfully, but in about 10 per cent of cases the sublingual may be higher than the rectal reading (at depths corresponding to the length of a clinical thermometer) for variable periods of time even under conditions of complete physiological rest (RENBOURN and TAYLOR). However, this finding is not new (CARMICHAEL and LINDER, 1934; RENBOURN, 1946). With muscular exertion the sublingual begins to rise faster than the rectal thermocouples, lags during the period of activity and falls faster with subsequent rest. Hence the relationship of oral to rectal temperature under conditions of work is not necessarily a question of technical errors, but depends in part upon the period when recordings are made. In a hot bath the oral rises faster than all rectal temperature curves, to reach, for a short period of time, a peak of 1–2°F above all of them (RENBOURN and TAYLOR). GERBRANDY *et al.* (1954) showed that when the body is artificially heated with hot intravenous saline, the mouth gives a much better indication than does the rectum. In the face of the above data it must be accepted that, as long as the requisite precautions in the measurement of oral temperature are taken, the rectum is not inherently a more "accurate" indicator of the so called "internal body temperature" than is the sublingual region. Because of the numerous sources of variation, experiments on body temperature should always be controlled, techniques standardised, and mean difference of comparable groups of data tested statistically. Finally, rectal temperature recording may be too disturbing for regular use in groups of normal individuals, particularly of athletes before a contest.

It has for long been accepted that children's temperatures are more labile, but otherwise correspond, more or less, to adult levels. In old age the range may be wider (HOWELL, 1948). WILLIAMS (1912), in a careful study of a thousand elementary school children, found that a half of those not suspected of suffering from tonsilitis, rheumatism or tuberculosis had an oral temperature of 99°F and above. Although it was agreed that a nervous child could "run a temperature for nothing", such nervousness was ascribed to the presence of the rheumatic toxin. In the same year WYNNE (1912) examined a similar number of school children and, accepting the normal range of oral temperature as 97·4–99°F, found about one third of the readings to be above normal, but he noted that "there exists a tendency for a more frequent departure from the accepted mean temperature than is generally recognised".

WHIPHAM (1914) pointed out that in children a transitory rise of oral temperature even to 102–103°F need not cause undue alarm. WILLIAMS *et al.* (1914) found, in a very large sample, higher oral temperatures in children from elementary schools than those from public schools. The difference was put down to a greater incidence of juvenile rheumatism and phthisis in the poorer classes. The often quoted work of SAATHOFF (1914) stressed that an oral temperature over 98·6°F was always pathological. An excellent review of the first half century of clinical thermometry and ideas of normal temperature limits, was produced by SIMMS WOODHEAD and VARRIER JONES (1916). In 1922 NEFF noted that, in otherwise healthy children, oral temperature up to 100°F or more could be found in the presence of apprehension or excitement. TALBOT (1925), writing in "Abt's Pediatrics", noted "an elevated temperature is one which is over 99°F, and although in the strict sense of the word it must be considered as fever, it is not necessarily pathological. The child who continually has a temperature of 99–100·5°F should, of course, be thoroughly studied. When these sources of infection are found to be absent, it is better to break the thermometer and treat the child like other normal children, since the chances are that he runs a habitually higher normal temperature than does the average child." DODD and WILKINSON (1927) stressed that in hot weather even higher temperatures than the above could occur in otherwise normal children. A large series of oral temperature readings were collected by WILLIAMS (1931) in groups of residential school children, in whom readings were taken twice daily for various periods of time. It was found that over the years 1916 to 1930, the incidence of "fever" (99°F and over) fell from 40 to 13 per cent. This was ascribed to a decrease in dental caries, tonsilitis, enlarged glands or rheumatism. PATON (1932) took a large number of readings (twice daily for several days) from girls in a boarding school, and concluded that an oral temperature over 98·4°F was abnormal. VAN DER BOGERT and MORAVEC (1937) found morning oral

temperatures over 99°F in about 30 per cent of 500 apparently healthy school children examined on one occasion. Another study in which repeated readings of normal school children were analysed (HAWKE, 1937), demonstrated rectal temperatures between 97·3 and 99·8°F, with higher figures after games. The HEATH CLARK study (1945) on young men examined on one occasion, gave for oral temperature a mean of 98·4°F (standard deviation 0·4°F with a range of 97–100·4°F.). IVY (1945), in a similar investigation of medical students, found early morning oral temperatures of mean 98·1°F, standard deviation 0·4°F and a range of 96·5–99·3°F. MCPHERSON and PETERSON (1947) collected a large number of oral readings (taken 4 times a day for a series of days) in a group of students who took their own temperatures in classroom. Readings over 99·2°F were unusual, but figures up to 99·6°F were accepted as probably within the normal range. In these various studies, the time for temperature equilibration, posture and activity, time of the day, environmental conditions and other sources of variation are not always specified. It is, however, of interest that where repeated oral readings were made on the same group of individuals, in whom "psychological acclimatisation" as described in our data had presumably taken place, figures over 99·2°F were unusual. This corresponds to our own findings for "home" ("psychologically basal") readings and for final readings (6th evening) of boys whose temperatures were taken before training exercise. In the papers on body temperature given above, it seems fairly evident that the "nervous" factor, although not mentioned, was sometimes in the mind of the investigator.

The presence of a raised temperature in "vasomotor neuroses" was described in 1911 by several German workers (EGGER, KAUFMANN, ROTH). FRIEDMANN and KOHNSTAMM (1914) suggested that the rise of body temperature with muscular exercise was due in part to psychic factors. DÉJERINE (1914) noted a febrile response in neurasthenia and in the "vasomotor neuroses". MORO (1915) described "Konstitutionselle Subfebrilität" in children. In a careful description of a case of hysterical fever, CAMPBELL and DOWLING (1920) suggested that the expression "nervous fever" was more appropriate. About this period a large literature on the matter was being published in Germany.

EICHELBERG (1921) noted the effects of suggestion and hypnosis in "psychogenic fever". OPPENHEIM (1923) found that a raised temperature might occur in children after a visit to a cinema. The expression "school fever" was used by POTOTZKY (1925) for the raised temperature seen in children unhappy at school or forced to eat food they disliked. "Hyperthermia nervosa", "Spitalsbesuchstagfieber" and "Ambulanzfieber" were expressions periodically met with in the German literature. HORDER (1925), BRÜNECKE (1926) and DEUTSCH (1926) upheld the concept of "psychogenic fever". REIMANN (1932) described a case and reviewed the literature up to this period. In an analysis of a large number of cases of P.U.O., ROWNTREE and KINTNER (1933) stressed that the diagnosis of "psychogenic fever" was too easily accepted. It was added that, independently of undiagnosed organic disease, a slight continued fever might occur in those with a predisposition to hypertension or rheumatic conditions. BENEDICT and BENEDICT (1933) confirmed that mental work had no effect on B.M.R. HAMMAN and WAINEWRIGHT (1936) pointed out that slight fever was common in neuro-circulatory asthenia (effort syndrome), a matter confirmed later by FRIEDMANN (1944). Another excellent review on the subject of "psychogenic fever" was that of ZIEGLER and CASH (1938). REIMANN (1940) described hypothermia in cases of neuro-circulatory asthenia with a vagotonic response. DU BOIS (1941), with long experience of problems about body heat, noted that "emotions, in certain susceptible individuals . . may give high readings merely from the excitement of visiting the doctor's office".

A matter which has somewhat encroached on the problem of "psychogenic fever" is that of the febrile "periodic disease" syndrome (WOLF and WOLFF, 1942; HITZIG and FANCONI, 1951; REIMANN, 1951). There have been occasional suggestions in the literature that psychological factors may play a part in some cases. RICHTER (1957) pointed out the resemblance between "periodic disease" and the cyclical febrile episodes in psychoneurotics, and gave experimental evidence from animals that neuro-hormonic factors might play a part in both syndromes.

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BACKWIN (1944) put forward evidence that hospitalization could itself raise body temperature in children, and HUNTER (1947) confirmed that catharsis of an emotional problem could sometimes cause a disappearance of unexplained fever in adults. WHITE, LONG and HILL (1958) in a recent investigation of hospital patients, noted that the incidence of a raised temperature immediately after first admission (for a non-febrile condition) was four times as great (14·0 per cent compared to 3·5 per cent) in the psychiatric as for all other services. Recent papers on "psychogenic fever" are by MALLISON (1959), GOODALL (1959), SHELDON (1959) and HENDERSON and STEVENSON (1959).

In the literature on "psychogenic" or "neurogenic" fever given above, most papers are descriptions of a single or a few cases, and the control of experiment is such as to hardly convince the physiologist or the practical clinician, who of necessity is ever mindful of organic disease.

However, as early as 1919, WYNN showed that a group of nurses had a lower mean oral temperature before an examination than after it. VAN DER BOGERT and MORAVEC (1937) demonstrated that children who did not show oral temperatures over 99°F, produced a rise of 0·8° to 1·8°F when deliberately exposed to simple emotional stress. FRIEDMANN (1944) investigated the effect of various procedures on the oral temperatures of cases of neuro-circulatory asthenia under controlled conditions. KLEITMAN and RAMSAROOP (1948) showed in a few individuals that mean oral temperatures after attending a cinema were higher than at the same time on "non movie" days. FRIEDMANN (1950) noted in a group of 40 psychoneurotics that about half had an oral temperature of 99·2–99·8°F on first attending his clinic, while in a control group of 100 patients (neither psychoneurotics nor suffering from infection) only one had a temperature as high as 99·0°F. GOODELL *et al* (1950) demonstrated that three normal individuals on standardised exercise in a climatic chamber had a slower fall of body temperature after exertion associated with emotional disturbance than when under "psychologically basal" conditions.

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Doubt still exists about the existence or significance of a raised temperature in otherwise normal individuals. Our results show that over six consecutive training evenings there was a fall to "basal" levels (99·1°F to 98·3°F) in mean pre-exertional temperature, but with the same number of consecutive boxing events there was no evidence for a change in pre-boxing temperature. It is inferred that, as measured by body temperature, "psychological acclimatisation" may occur where apprehension disappears with experience of a situation, but not where the outcome remains unknown (e.g. boxing). The same may, perhaps, be true in some individuals for other fairly common occurrences (e.g. medical and other examinations, flying, motor-car driving or racing, parachuting, etc.). Where excitement runs particularly high (before an important boxing match), controls in the audience may show as high an oral temperature as contestants. The same phenomenon has been found in an investigation on trained soldiers before a parachute jump. A higher mean oral temperature (but not pulse) was found in parachutists than in equally trained controls. However, on one occasion when controls were fully equipped with parachute harness etc. and in sight of the plane, there was no significant oral temperature difference between the groups. It appeared later that although told firmly by the sergeant in charge that they were not going to jump, the men did not fully believe it. Since the mean temperature difference over controls (about 0·4°F to 0·5°F mean) is very similar in parachutists before a jump, adult boxers before a contest and young athletes before an event, it does not appear that the fear of getting hurt, severely injured or killed, is itself the important factor in "emotional hyperthermia". BASOWITZ *et al.* (1955) found the

eosinophil response with parachuting to be of the same order as that caused by sitting for an examination. A state of non-specific chronic apprehension or anxiety may be the underlying stimulus for these responses. Examination of our data suggests that even control groups of schoolboys waiting to see a boxing match have a mean oral temperature above "basal" levels and this would appear true for the older groups of controls. As in the case of boys examined in school, these may be examples of more acute emotional stress. Young men appear to develop a smaller rise of temperature (compared to controls) than schoolboys when exposed to a similar situation (waiting to box). However, not all boys show the phenomenon, and its incidence may decrease with age. Data are required on the relationship of age and sex, nature and intensity of emotional stress to physiological functions.

German authorities sometimes refer to "psychogenic fever" as "Konstitutionselle Subfebrilität". This may, perhaps, correspond to the "cerebrotonic" of SHELDON and STEVENS (1942), a type of individual characterised by "tenseness, unrelaxability, apprehensiveness.. and thermal instability". On the other hand, the "viscerotonic" (with abundance of "guts") does not show so called "buck fever". These constitutional types are, however, somewhat reminiscent of the hot "choleric" and the cooler-headed "sanguine" types of the early Greek physicians.

A dissociation between body temperature, pulse rate and respiration has been described in functional and organic disease of the hypothalmus (BAUER, 1954). Pulse and respiration do not appear to be particularly affected in cases of hysterical fever, and where data are available this appears to be more or less true for "psychogenic fever" (EICHELBERG, 1921; FRIEDMANN, 1944; RAPPAPORT, 1946). This fits in with our own findings, but confirmation on this point is required. Where a significant difference in oral temperature between contestants and controls was found, this has invariably been absent for pulse rate. Unfortunately we have no figures to offer for psychologically "basal" pulse rates, but it would appear that in a state of chronic apprehension, the pulse rate in healthy boys, youths and young men is somewhat raised, but to a less extent than oral temperature. On the other hand, it is well known that in many individuals the pulse is affected by acute emotional stress. The investigation on parachutists, mentioned above, demonstrated that although no significant pulse rate difference was found between parachutists and controls whilst on the ground, the former showed a mean rise of 34 beats per min (maximum 58 per min) over that found before the ascent, immediately before jumping out of a plane.

Data presented here suggest that in young males under conditions of minor excitement, 1°F rise in temperature is equivalent to an increase of about 6 beats per minute. This figure is less than the ratio given by KLEITMAN and RAMSAROOP (1948), and than the 1 to 10 relationship accepted by most text books. It is clear from an examination of our data that the relative variability of the pulse rate (as measured by the coefficient of variation, 100 × S.D./mean) is much greater than for oral temperature.

It was noted in the boxers under investigation, particularly the boys, that before a bout palms and axillae were almost invariably perspiring, but evidence of any sweating was always absent on the trunk and limbs. The trunk was usually warm but the limbs cool to the touch. It is often stated that a rise of internal temperature of 0·5–1°F (due to external heat or exercise) is associated with generalised sweating. This, however, does not appear to be true for our cases of "emotional hyperthermia", and it may be that thermal sweating is in fact inhibited. The presence of "goose skin" on the trunk and limbs (again better marked in boys than men) together with an oral temperature of 100–101°F before boxing, suggests the presence of cutaneous vasoconstriction with or without an increased metabolic heat production. This brings the findings in "emotional hyperthermia" somewhat in line with those of a febrile rigor.

However, shivering was not seen in any of the boxers. Before a bout it was unusual for a boy to say he felt warm, the usual comment being "I feel ordinary". Boxers commonly had a preoccupied air except when chatting, but otherwise showed no particular signs of excitement.

There is a wide literature on the effect of emotional conditions on skin temperature and blood flow, and the consensus of opinion is that although a variation of response exists between individuals and with different disturbing emotions, there is usually a fall in skin temperature and decrease in finger blood flow as measured by a plethysmograph (VAN DER MERWE, 1938; ZIEGLER and CASH, 1938; MITTELMAN and WOLF, 1939; BURCH and RAY; 1948). The colour or temperature of the skin is, however, not always a good measure of its blood flow (BAKER and TAYLOR, 1954). In groups of normal individuals THERON (1948) found that those with a labile personality showed the greater changes in blood flow. It would appear that in "emotional hyperthermia", heat loss may be decreased by both vasoconstriction and inhibition of sweating.

A dissociation between skin and oral, or oral and rectal temperatures has been described in psychoneurotics.

DEUTSCH (1926) found the oral temperature lower than the axillary in a case showing "psychogenic fever". CARMICHAEL and LINDER (1934) found no significant difference between the mean rectal temperature of schizophrenics and normal individuals, but the latter had the lower mean oral temperature. In individuals with "oral hyperthermia" following an infectious condition, RAPPAPORT (1946) noted that the oral was frequently equal to or greater than the rectal temperature. This phenomenon, as noted above, may sometimes occur in perfectly normal individuals. On the other hand, FRIEDMANN (1944) found the rectal to parallel the oral temperature in a group of psychoneurotics showing "neurogenic fever". Further study is required on the relationship of superficial and deep blood flow and temperature in psychoneurotics and in normal individuals exposed to emotional stress.

Decreased heat loss through the skin may itself raise body temperature, but another factor to be considered is an increase in metabolic heat production. The relationship of voluntary muscle tone to emotional state in normal individuals and in psychoneurotics has been investigated by JACOBSON (1929), DAVIS (1938) and COURTS (1942). However, the rise in body temperature on adopting the vertical posture after lying horizontally is not entirely due to changes in muscular tone and may arise in part from a redistribution of blood. We have no objective proof for an increase of muscle tone before a sporting contest, but the "goose skin" found in the young boxers is somewhat suggestive.

A raised body temperature is present in many diseases in which infection, plays no part as far as is known (e.g. heat stroke, tissue necrosis or hyperplasia, certain reticuloses and new growths, collagen diseases, gout, etc.). The neuroendocrinal system play a direct or indirect part in heat production, but little is known of its role in the above disorders. The rhythm of body temperature during the menstrual cycle is widely accepted, and administration of progesterone (BARTON and WEISNER, 1945) and its derivatives (DAVIS and WIED, 1957) produce a temperature rise. An elevated B.M.R. and slight pyrexia are features of hyperthyreoidism. On the other hand, as shown by LANDIS (1925), ZIEGLER and LEVENE (1925), GESSLER and HANSEN (1927) and others, there appears to be no clear relationship between emotional status in either normals or psychoneurotics and the B.M.R. In infections, on the other hand, the B.M.R. and body temperature run parallel. Pituitary and suprarenal disorders (e.g. Simmond's disease, Cushing's syndrome, phaeochromocytoma etc.) may be associated with slight body temperature disturbance, but neither pituitary hormones nor adrenal corticoids appear to have a direct physiological action on body temperature, although they may inhibit the rise or fall because of other causes. It is thus of interest to note that the administration of etiocholanolone (KAPPAS *et al.*, 1957) produces a well marked pyrexia after a lag period of several hours.

We have shown that boys who have had repeated periodic clinical examinations over a few months, and who appear healthy by ordinary standards, may have an oral temperature above their "basal" levels for an evening or more before a boxing contest. The fact that a raised temperature occurs in a group of children on leaving

a classroom, suggests that either this is present while they are still in their seats or it breaks out as an "epidemic" within a few minutes of meeting together under unusual circumstances. The evidence of FRIEDMAN and KOHNSTAMM (1914), EICHELBERG (1921), and FALCON-LESSES and PROGER (1930) fits in with the supposition that body temperature may rise or fall within a few minutes of exposure to hypnosis, suggestion or to emotional stress. This makes it tempting to assume that liberation of adrenaline or noradrenaline may play a part in the response.

The rapid calorigenic action of adrenaline (BOOTHBY and SANDIFORD, 1920) is associated with cutaneous vasoconstriction and a rise of body temperature. Recently DEUTSCH *et al.* (1954) have shown that noradrenaline in man and animals has a similar effect without the cutaneous response. However, the calorigenic action of both adrenaline (GRIFFITHS, 1951) and noradrenaline (VON EULER, 1955) has been questioned. BULBRING and BURNS (1949) suggested that short duration stimulation in animal preparations leads mainly to an adrenaline effect and long acting stimulation to a predominantly noradrenaline action. GOFFART (1952) demonstrated that in "emergency" reactions in animals, both hormones may play a part in the increase of postural tone. In recent years a number of papers have appeared on the relationship of adrenaline and noradrenaline to different animal species (MCGOODALL, 1951), to muscular work (EULER and HELLNER, 1952) and different varieties of emotional stress (AX, 1953; EULER, 1955; FUNKENSTEIN, 1955), but results are somewhat conflicting. ELMADJIAN *et al.* (1957) carried out a study on the excretion of adrenaline and noradrenaline before and after athletic games (including boxing) and the results fit in with the possibility that liberation of these rapidly acting substances may be the background of "emotional hyperthermia". The work of MUNRO and ROBINSON (1958) suggests that a similar mechanism may play a part in the change of body temperature with variation of posture. However, these observers noted the absence of a relationship between the plasma adrenaline or noradrenaline and pulse rate or blood pressure. A number of papers have appeared on the effect of muscular work or emotional stress on the blood eosinophil cells (RENOLD *et al.*, 1951; WAKE *et al.*, 1953; MARKKANEN *et al.*; 1955, etc.), but this response is slow (a lag of several hours) compared to the effect of such stimuli on body temperature and pulse. Work is proceeding in this laboratory on the time relations of these physiological responses to stress.

TALBOT (1931) and NIELSEN (1938) suggested that the rise of temperature with muscular exertion is not due simply to an inability to lose heat sufficiently quickly but represents a compensatory physiological response.

ASSMUSEN and BOJE (1945) showed that muscle viscosity decreases with rise of body temperature, and KLEITMAN and JACKSON (1950) demonstrated that alertness and psychomotor performance run parallel to the diurnal body temperature curve. It may be that "emotional hyperthermia" is part of the biological fight-flight response, a response which has become somewhat vestigial for man. With these facts in mind, the work of BRITTON and KLINE (1939) is of particular interest, for these investigators noted that procedures which evoke a "rage" response, produced a rise of both rectal temperature (up to 2·8°F) and of blood sugar in various intact mammals and reptiles. However, CRILE, as early as 1922, noted that both animals and children showed a rise in body temperature in the face of emotional stress.

Disturbances of body temperature are known to occur as a result of trauma or disease of the frontal cortex, hypothalamus (BAUER 1954), brain stem and their various connections. FOLKOW and EULER (1954) suggest that the fight-flight centre of HESS (1948) may be in the site of selective adrenaline liberation, and in the "rage" response of animal preparations there is an associated centrally initiated sketetal muscle vasodilator response (ELIASSON *et al.*, 1951; LINDGREN *et al.*, 1956; ABRAHAMS and HILTON, 1958).

AMSLER (1927) described a fall of body temperature in animals exposed to severe pain, but this phenomenon is related more to shock states than to emotional stress in man. REIMANN (1940) describes the presence of hypothermia in cases of neurocirculatory asthenia showing vagotonia. The so called "emotional hypothermia" of

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small laboratory animals (BARTLETT *et al.*, 1953; HEROUX and HART, 1954) is probably due to the imposed physical restraint. Apart from these examples, true emotional hypothermia has not yet been described.

Data are available on physiological changes (adrenaline or noradrenaline secretion, ketosteroid excretion, change in blood eosinophil cells, etc.) arising in adults from the psychological stress of sitting for an examination. Investigations into the physiological and psychological responses (and clinical implications) of children to the "eleven plus" examination might be well worth while. Although the body temperature is "raised" in apparently healthy school children under the mild stress of being examined in a group for the first time, the suspicion, present in the minds of clinicians over the last half century, that an oral temperature of 101°F or over may occur in a "nervous child" in the absense of organic disease may be well founded. Although we have used "home" as being synonymous with psychologically "basal" temperatures, the home environment may itself be the source of the stress. Since both warm weather and emotions can each separately raise body temperature, we may have a clue to the possible link between psychological disturbance and liability to heat disorders in the tropics (RENBOURN, 1959).

In the face of the existence of the various factors which may modify the internal body temperature, what is to be accepted as the normal mean and range of values? It is generally accepted that under experimental conditions, changes in body temperature (skin, oral or rectal) of a healthy human subject are entirely due to physiological changes. Since, however, physiological procedures (exposure to a climatic chamber, injections of hormones, drugs etc., the sight or sound of complicated apparatus, etc.) are not part of ordinary experience, it must be conceded that they may themselves sometimes represent a form of psychological stress to an experimental subject (RENBOURN *et al.*, 1959). The increasing literature on psychosomatic relationships demonstrates that the distinction between physiological and psychological stress (or "strain") may be, in great part, of an academic nature.

Our data from 150 schoolboys waiting to box shows that, using the 95 per cent confidence band, a sublingual temperature of 101°F with a pulse rate of about 116 per minute (taken in the upright posture) represent the upper limit of the "normal" range of values for indoor conditions in the winter. With figures above these levels it may perhaps be wiser to re-examine the boy or not allow him to box. Knowledge of the "psychologically basal" levels would clearly be of great value. From data of this kind and from other physiological or psychological investigations, it may be possible to weed out the individual unfit for a contest. With the present interest in athletic peak performance, and in the face of the controversy as to the dangers of professional boxing, such an approach might pay useful dividends.

We cannot end on a better note than to quote from a recent leader in the British Medical Journal (Editorial, 1959): "It now remains for the specialist in psychosomatic disorders—that is, the general practitioner—to disclose how often and why people get hot under the collar".

SUMMARY

A study was made of resting oral temperature and pulse rate, taken under standardised conditions, of schoolboys and young men before amateur boxing contests and youths before athletic events. In the schoolboys, measurements were taken

before and after training exercises and after boxing contests, both of which took place in the evenings. Control groups of comparable age were obtained from audiences examined at the same time and place as contestants. A group of boys was examined during an afternoon in school.

Data obtained in school showed that during a winter afternoon 60 per cent of 116 apparently healthy boys had a resting oral temperature of 99°F or more and a pulse rate of 90/min or more.

Boys showed a raised mean pre-training oral temperature which over six evenings fell from 99·1°F to 98·3°F. Over a similar period there was no significant fall in pre-boxing temperature. It is suggested that the latter result can be explained by lack of "acclimatisation" to a situation which continues to involve apprehension. Before boxing, contestants had a mean temperature 1°F higher than the audience, but on a particularly exciting evening the means were identical. No difference was found between the mean oral temperatures or pulses of boys who boxed on the home ground and those of visiting teams.

Training exercises of half an hour's duration produced a negligible rise in oral temperature, but an appreciable rise in pulse rate. With three rounds of boxing there was a mean fall of oral temperature of 1°F (most of which is an artifact), but a marked rise in pulse rate took place.

Under the "basal" conditions of home, a small group of boys had a mean evening temperature of 98·15°F. This result suggested that the mean temperature obtained in school hours and that found in the audiences were not "basal". The mean pre-training and pre-boxing figures for a group of the same boys was 98·68°F and 99·59°F respectively. However not all boys showed a raised pre-training oral temperature, and about a quarter showed no raised temperature before boxing. The maximum rise in oral temperature before boxing was 2·0°F over the "basal" level.

Adult boxers showed before bouts a mean oral temperature 0·5°F greater than controls. Changes over the accepted normal were found in blood pressure, but glycosuria was absent.

Young athletes had a mean pre-contest oral temperature 0·4°F above controls.

Apart from data given above, while significant differences were found between contestants and audience for oral temperature, they were absent for pulse rate.

Resting oral temperatures over "basal" levels are ascribed to "emotional hyperthermia", a condition which may apparently have little effect on the pulse rate. Evidence is presented which suggests that "emotional hyperthermia" is not due primarily to fear. The phenomenon appears to decrease with age.

The possible mechanisms of this condition are outlined, and the implication of the various findings reviewed in the light of the literature.

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THE RELATIONSHIP BETWEEN AFFECT AND THE EXCRETION OF ADRENALINE, NORADRENALINE, AND 17-HYDROXYCORTICOSTEROIDS*

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SEYLE's (1947) formulation of the concept of "stress" has been widely used in the study of the relationship between psychological processes and processes related to the adrenal gland. Terms such as "emotional stress" or "psychological stress" are used to describe a variety of states which may have much or little in common. A psychological dissection of the meaning of these terms could proceed along any of several lines. One useful approach has proved to be a dissection according to the types of affect experienced by the subject under "stress". A number of workers including BLISS *et al.* (1956), BOARD *et al.* (1956), PRICE *et al.* (1957), BOARD *et al.* (1957), and PERSKY *et al.* (1958) have found that the quantities of 17-hydroxycorticosteroids in blood and urine correlate positively with the intensity of unpleasant affect, regardless of its quality. The relationship between affect and catecholamines in the plasma and urine has been studied less intensively. ELMADJIAN *et al.* (1958) reported increases in catecholamine excretion in the urine of subjects under (emotional) "stress" and interpreted their data as supporting the hypothesis (FUNKENSTEIN *et al.*, 1957) that outwardly directed anger is associated with vascular responses resembling those induced by noradrenaline and that anxiety or inwardly directed anger is associated with vascular responses resembling those induced by adrenaline. REGAN and REILLY (1958) enumerated several psychological characteristics which in their data favoured a parallel relationship between intensity of affect and plasma noradrenaline, and several other psychological characteristics which favoured a parallel relationship between intensity of affect and plasma adrenaline. Although a beginning has been made, the relationship between affect and catecholamines requires more work for clarification.

While noradrenaline, adrenaline, and 17-hydroxycorticosteroids are all presumably related to "stress" responses, and, by that token, to affect, there have been very few studies of the relationship between the quantities of these substances in the plasma and urine of human subjects or of intact and physiologically unmanipulated animals. The present study was designed to investigate the relationship between these substances in the urine of psychiatric patients and of normal human subjects. A second objective was to learn whether affective states of differing quality bear any preferential relationship to the excretion of any of the three hormones.

SUBJECTS AND METHODS

Two groups of nineteen and twenty healthy subjects, were studied. These consisted of physicians and their wives, biochemists, nurses, laboratory technicians and household staff of the

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hospital. The first group, hereafter designated as "Healthy 1" contained twelve females and seven males. Ages ranged from 22 years to 67 years, with a mean of 31 years. These subjects collected urine for a single 24 hr period, selecting a day which was not expected to be especially difficult or stressful. The second group of twenty healthy subjects, hereafter designated as "Healthy 2", consisted of fifteen females and five males. Their ages ranged from 16 to 69 years with a mean of 31·6 years. These subjects collected urine in the same manner except that two consecutive 24 hr collections were made. Eleven subjects were common to both groups. For administrative reasons the healthy subjects were not interviewed. Most of them were known personally to the writers and they were assumed to experience considerably lesser degrees of pathological affect than did the hospitalized psychiatric patients.

The remaining subjects were thirty-seven psychiatric patients recently admitted to an acute service. Patients were excluded if they were too disturbed or too confused to co-operate in the collection of urine, or if the attending psychiatrists felt that the conditions of the study would be detrimental to the patient. An additional few were excluded because of accidental failure to complete the collection of urine. The study was occasionally interrupted to avoid overtaxing the laboratory staff and facilities. Aside from the foregoing exceptions the patients were selected by consecutive admission to the public and private services of the three attending psychiatrists whose co-operation had been secured. During the course of the study it was discovered that patients with the most severe depressions were being given ECT as out-patients or in the day center to circumvent the risk of suicide during the unavoidably long period of waiting for admission. Hence this important group of patients did not become available for study.

With the exception of a standardized dose of a mild bedtime sedative (Dormison® 500 mg), given to all patients whether or not they had difficulty sleeping, drugs and physical therapies were withheld during the 48 hr comprising the study. However, many patients had been on tranquilizing drugs prior to admission. Five patients had mild to moderate organic mental impairment, one of these having mild cerebral palsy and one epilepsy. The epileptic patient was permitted to continue her accustomed dosage of Dilantin® throughout the period of study. Two patients were hypertensive. In addition, there was one case of each of the following disturbances: severe obesity, mild diabetes mellitus, eczema of the hands, mild bronchitis and asthma, and undernourishment because of anorexia of psychic origin. The remaining patients were in good physical health. Age and sex distribution of the subcategories of the patient group will be presented in tabular form with the results of the study.

As soon as possible after each patient's arrival on the ward urine collections were begun. Urine voided during the first and second 24 hr period was kept in separate bottles, each containing 10 ml of a solution of concentrated hydrochloric acid diluted with water 1 : 1.

Creatinine content of each 24 hr urine specimen was determined to verify the completeness of the collection.

The total content of adrenaline and noradrenaline of each 24 hr specimen was determined in duplicate by the trihydroxyindole fluorescence method (Drujan *et al.*, 1959; Sourkes and Drujan, 1957). Agreement between duplicate determinations of the same sample of urine is of the order of plus or minus 5 per cent. Recovery controls showed that recovery of adrenaline or noradrenaline added to urine is of the order of 70 per cent. Results given in this paper have been corrected for these losses in the extraction procedure. The mean of the duplicate determinations was used to calculate the catecholamine content of each 24 hr sample of urine.

17-Hydroxycorticosteroids were determined in duplicate by a modification of the Porter–Silber method (Silber and Porter, 1954; Silber and Bush, 1956). Agreement between duplicate determinations of the same sample of urine are also of the order of plus or minus 5 per cent. Recovery controls showed that the recovery of cortisol added to urine is of the order of 90 per cent. These determinations were performed in a laboratory separate from the one in which catecholamines were determined. Because of differences in customary procedure the results of corticoid determinations were not corrected for losses in the extraction procedure. The mean of the duplicate determinations was used to calculate the corticoid content of each 24 hr specimen of urine.

Patients were classified according to whether the major affective content characterizing the illness (and characterizing in particular the 2 days of the study) was anxiety or depression. Perhaps the simplest guide to the criteria for differentiation of the two affects is a statement by Abraham (1949): "Anxiety and depression are related

to each other as are fear and grief. We fear a coming evil; we grieve over one that has occurred". As ABRAHAM (1949), CAMERON (1945), and many others have noted, all persons suffering mainly from depression also experience anxiety and vice versa. Hence the assigning of a classification constitutes an estimation of relative prominence of these affects based on clinical judgement. Four categories were adopted: (1) mainly depression, (2) mainly anxiety, (3) mixed, i.e. anxiety and depression in approximately equal prominence, and (4) miscellaneous. The third category included mainly persons who in classical psychiatry would be said to suffer from agitated depressions or from mixed neurotic reactions. The fourth category consisted of persons whose presenting difficulties were disturbances in thought or behaviour. An attempt was also made to rate the intensity of affect. However, most systems used for this purpose are designed for application to a brief period of time. It was not possible to reach a satisfactory consensus on ratings based on a 24 hr period, and the attempt was abandoned for the time being.

Classification was arrived at by consensus between one of the writers (G.C.C.), who interviewed the patients and studied the ward nurse's running account of speech and behaviour, and the attending psychiatrist who employed the standard diagnostic procedures. The writer's interviews were focused specifically on affective experience and were recorded on magnetic tape. In certain instances in which the results of the hormone determinations came to the attention of the first writer, his opinion was replaced by that of another writer (R.A.C.), who listened to the recorded interviews and studied the observations of the nurses. Assignment of a patient to categories (1), (2) or (4) meant agreement between the two observers. Assignment to category (3) meant disagreement or uncertainty as to which affect was more prominent.

Two methods of analysing the data were used. For study of the relationships between the hormones the covariance method (SNEDECOR, 1940) was used. For study of preferential relationships between affect states and hormone excretion the analysis of variance (SNEDECOR, 1940) with a three-way classification (affect $\times$ sex $\times$ hormone and two observations per cell (the first and second days) was used. In order to permit meaningful interpretation of the latter analysis it was necessary to multiply (code) each adrenaline datum by 3·07 and each corticoid datum by 6·17 in order to equalize the grand means of each hormone. This operation also had the effect of approximately equalizing the standard deviations. For the first analysis both groups of healthy subjects were included, because they showed a marked difference in the degree of correlation between noradrenaline and corticoids. For the second analysis the "Healthy 1" group was omitted because they had collected urine for only 1 day. The mean excretion of each hormone was approximately the same in the "Healthy 1" and "Healthy 2" groups.

RESULTS

Covariance and correlation studies

Preliminary analysis revealed that the coefficients of regression of adrenaline on noradrenaline did not differ significantly from group to group. The same was true of the regression coefficients for corticoids on noradrenaline and for corticoids on adrenaline. In other words, the six groups may justifiably be considered as samples from the same population in so far as the coefficients of regression of one of these hormones on another is concerned. Hence for each relationship between a pair of hormones the average regression within groups was used as the basis for calculating

correlation coefficients. The correlation coefficients thus obtained were: noradrenaline × adrenaline, 0·5003 ($p < 0·001$); adrenaline × corticoids, 0·2477 ($p < 0·01$); noradrenaline × corticoids, 0·1536 ($p > 0·05$) (127 degrees of freedom in each instance). These results are included in Table 4 in the 'Discussion' for comparison with the findings of other workers.

TABLE 1.—MEAN DAILY HORMONE EXCRETION BY GROUPS

Group	Subjects	Male	Female	Mean age	Mean daily excretion			
					Total coded	Noradrenaline	Adrenaline	Corticoids
Healthy 2	20	5	15	31·6	56·2	54·3	56·0 (18·2)*	58·3 (9·4)
Depression	10	1	9	44·5	56·0	62·9	51·4 (16·7)	53·6 (8·7)
Anxiety	7	4	3	37·6	56·5	56·2	49·2 (16·0)	64·2 (10·4)
Mixed	10	2	8	48·4	68·4	59·7	73·2 (23·8)	72·2 (11·7)
Miscellaneous	10	3	7	36·6	65·3	70·8	70·5 (23·0)	54·6 (8·9)

* Figures in parentheses are means of uncoded data.
Noradrenaline and uncoded adrenaline expressed as mμg/24 hr.
Uncoded corticoids expressed as mg/24 hr.

TABLE 2.—ANALYSIS OF VARIANCE: FACTORS AFFECTING HORMONE OUTPUT

Sources of variation	Sum of squares	*df*	*MS*	*F*	*p*
Total	179,758·8	341			
Hormones	1·0	2	—	—	—
Affect	9103·1	4	2275·8	4·680	<0·01
Sex	3672·2	1	3672·2	7·550	<0·01
Interactions					
affect × hormones	9064·4	8	1133·1	2·330	<0·05
sex × hormones	2192·4	2	1096·2	2·254	n.s.
sex × affect	2130·1	4	532·5	1·095	n.s.
affect × hormones × sex	1866·5	8	233·3	—	n.s.
Error*	151,729·0	312	486·3		

* Pooled sums of squares and degrees of freedom for within—subjects and between—subjects variation.

Relationship between affect and hormone excretion

Tables 1 and 3 present the findings of this portion of the study in summary, and Table 2 presents the statistical analysis.

As mentioned previously, the data on noradrenaline excretion are unaltered. Because of the coding operations the figures for mean daily adrenaline excretion and

mean daily corticoid excretion are, respectively, 3·07 and 6·17 times the actual values. The means of the original uncoded data are included in parentheses in Tables 1 and 3.

The column labelled "total coded" under the heading "mean daily excretion" in Table 1 may require explanation. For a given group of subjects this quantity was determined by taking the group's total noradrenaline excretion plus its total coded adrenaline excretion plus its total coded corticoid excretion. The result of this addition was then divided by the total number of data entries making up the sum. An average

TABLE 3.—MEAN DAILY HORMONE EXCRETION BY SEX

	Male	Female
Total coded	65·4	58·0
Noradrenaline	62·0	59·1
Adrenaline	62·8	58·9
	(20·5)	(19·2)
Corticoids	71·5	55·9
	(11·6)	(9·1)

Figures in parentheses are means of uncoded data.

figure based on the sums of the original uncoded data would be controlled mainly by the noradrenaline values and would not be very instructive.

Inspection of Table 1 reveals that the groups designated "miscellaneous" and "mixed" have the highest values of mean daily total coded hormone excretion. Table 2 shows that these group differences are statistically significant ($p < 0{\cdot}01$). In the "mixed" group this high value is mainly attributable to high levels of adrenaline and corticoids. In the "miscellaneous" group the high mean total is attributable mainly to high levels of adrenaline and noradrenaline. The mean daily total coded hormone excretion values are practically the same in the "Healthy 2", the "Depression", and the "Anxiety" groups. In the "Depression" group adrenaline and corticoid values are slightly low while noradrenaline excretion is higher. In the "Anxiety" group, adrenaline excretion is low while corticoid excretion is high. The selective, or differential, relationships between affect and the rates of excretion of the different hormones are statistically significant, as is shown by the fact that the affect $\times$ hormone interaction is statistically significant (Table 2, $p < 0{\cdot}05$).

Males secreted more of each hormone than did females (Table 3). Table 2 shows that sex differences are significant ($p < 0{\cdot}01$). The sex difference appears more marked for corticoids than for the catecholamines, but this differential relationship fails to achieve statistical significance.

DISCUSSION

The literature contains few reports of determinations of noradrenaline, adrenaline and corticoids in the same urine. The studies which have been carried out concern a variety of subjects, conditions of study, and duration of urine collection. However, certain comparisons are possible.

ELMADJIAN *et al.* (1958) studied thirty-four professional hockey players participating in seven games. The amounts of noradrenaline and adrenaline excreted were significantly correlated, but this was not true of any other pair of hormones.

HAILME *et al.* (1957) determined all these hormones simultaneously on 24 hr specimens of urine obtained from 102 surgical patients during the preoperative period and during the first seven postoperative days. These authors reported significant correlations between the following variables: noradrenaline and adrenaline in men on the first to third postoperative days; noradrenaline and corticoids in men and women on the first two postoperative days in "major" operations; noradrenaline and corticoids in men and in the whole series on the fourth to seventh postoperative days. Correlation coefficients were not given in their paper.

TABLE 4.—CORRELATION COEFFICIENTS; SUMMARY OF FINDINGS OF AVAILABLE STUDIES

	Noradrenaline × adrenaline	Noradrenaline × corticoids	Adrenaline × corticoids
Present study Psychiatric patients and Healthy subjects	0·5003 $p < 0{\cdot}001$	0·1536 p n.s.	0·2477 $p < 0{\cdot}01$
GEMZELL *et al.* (1956)* Women in labour	0·5561 $p < 0{\cdot}01$	0·6351 $p < 0{\cdot}01$	0·4761 $p < 0{\cdot}05$
HAILME *et al.* (1957) Postoperative patients	Variable r's not stated	Variable r's not stated	r not stated p n.s.
ELMADJIAN *et al.* (1958) Professional hockey in competition	0·48 $p < 0{\cdot}01$	0·22 p n.s.	0·05 p n.s.

* r's calculated by present writer from raw data of GEMZELL *et al.*

GEMZELL *et al.* (1956) studied sixteen normal women undergoing normal labour and delivery. Urine was collected in three consecutive periods: I—period of weak pains; II—severe pains and delivery; III—for about 3 hr after delivery. From the raw data provided in their tables it has been possible to calculate correlation coefficients. For this purpose we used data from thirteen of their patients—all those on whom values for all three hormones were present for at least two of the three periods. All three pairs of hormones showed significant correlation, both before and after adjusting for differences between subjects and between periods.

Table 4 summarizes the results of available correlation studies of the urinary excretion of these three hormones. With one exception, the correlations between urinary adrenaline and noradrenaline are consistently of high statistical significance. Even in the postoperative patients the correlation was significant in certain subgroups of subjects at certain times. On the basis of the available evidence it would seem safe to regard the tendency toward correlation between urinary adrenaline and noradrenaline as a biological characteristic of functioning human beings, despite the fact that adrenaline and noradrenaline are differentially secreted (EULER, 1956).

The findings with regard to the relationship between urinary catecholamines

and 17-hydroxycorticosteroids are less consistent. Any overall tendencies for correlation, if they exist, must certainly be of a lesser order of magnitude than that characterizing the relationship between the catecholamines. The differences in findings may result from sampling variation. On the other hand it is also conceivable that future research may make it possible to specify conditions and subjects in which significant correlations do and do not exist. The findings do not support the opinion of EULER (1956) that noradrenaline and corticoid excretion may be inversely related.

The tendency toward a differential excretion of the hormones studied in states of anxiety and depression appears to be superimposed on the tendencies toward their correlated output. However, this portion of the study has several drawbacks. Among these are the small number of patients in each of the groups, the limited range of severity of distress, the unknown influence of the drugs which many patients had received prior to admission to hospital, the unequal sex distribution, the probable non-random distribution of intensity of suffering, and the failure of the efforts to rate intensity of suffering on a 24 hr basis. It is also quite possible that some of the "healthy" subjects secretly suffer from considerable degrees of neurotic anxiety and/or depression. As a gross preliminary approach in search of guides to further investigation this portion of the study may not, however, be totally worthless.

Despite the difficulties mentioned in attempting to rate distress on a 24 hr basis, it was the writers' distinct impression that the most constant and most intense suffering occurred in the "mixed" and in the "depression" groups. Of course, both of these groups contained a few patients who appeared to suffer very little. The failure of the "depression" group to show high rates of corticoid excretion is interesting in light of the report of BOARD *et al.* (1957) of elevated plasma corticoids in depressed patients. Unfortunately, these authors did not report on the excretion of urinary corticoids by their subjects. Hence it is not possible to guess at the relationship of depression, as opposed to other "stresses", to the metabolism and renal clearance of corticoids. It is also important to remember that these authors had access to patients with depression of all degrees of severity, while patients with the severest retarded depressions did not become available for the present study.

It was surprising to note the relatively high rates of hormone output by some of the patients in the "miscellaneous" group, who did not appear to be suffering greatly. This was particularly true of three of the patients who had used alcohol excessively. The distinctive psychological characteristic of these people was their impulsiveness and their tendency to translate feeling immediately into action.

The high rate of hormone output by the mixed group was in line with expectation except that the failure of noradrenaline to participate was unexpected. It so happened that both of the hypertensive patients were classified in this group, and their noradrenaline output was low in relation to adrenaline and corticoids. Hypertensive patients may excrete less noradrenaline than non-hypertensives (MOLLER *et al.*, 1957). However, it is questionable whether these two patients distorted the results significantly.

It is certainly too early to generalize from the results of this latter portion of the study. Assuming that the results could be confirmed in another study, it is still possible that a slightly different application of the concepts of anxiety and depression might produce different findings. As they stand, however, the results tend to suggest that affective states of differing quality are not non-specific in SELYE's sense if one

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relates them to the balance between hormones rather than to a single hormone. This interpretation must remain tentative until confirmed by further study and until the problems of metabolism and renal clearance of these hormones are clarified.

One general principle does seem to be supported both by the findings of this study and by much of the literature referred to above. In studying "mind-body" relationships particularly when reversible changes such as adrenal activity are involved, it would seem promising to focus on reversible psychological processes (such as affective states) without regard for what psychiatric "disease" the subject may "have". The opposite approach—searching for somatic changes in one or another "disease" without regard for whether the subject is angry, frightened, discouraged or ashamed at the time of observation—has a long and fruitless history.

The occurrence of affect is, of course, regulated and influenced by many dimly understood interpersonal and psychological processes and probably by biological processes which have yet to be described.

SUMMARY

In the present study, and throughout the small quantity of pertinent literature, the urinary excretion of adrenaline and noradrenaline are highly correlated. The opinion is expressed that this tendency is a biological characteristic of human beings. In the present study urinary adrenaline and 17-hydroxycorticosteroids were significantly correlated but not to as great a degree as urinary adrenaline and noradrenaline. No significant correlation was found between urinary noradrenaline and 17-hydroxycorticosteroids. The data suggest that in affective states of depression noradrenaline is excreted preferentially in comparison with adrenaline and corticoids, while corticoids are excreted preferentially in states of anxiety. In states of mixed affect there was a preferential excretion of adrenaline and corticoids. In subjects whose principal difficulties were disorders of thinking or behaviour, there was a preferential excretion of adrenaline and noradrenaline. Reasons are given for caution in generalizing from these findings. As they stand, however, the findings suggest that various qualities of "emotional stress" are not non-specific in SELYE's sense if one relates the affective state to the balance between hormones rather than to a single hormone.

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THE EFFECT OF GROUP VS. INDIVIDUAL HOUSING ON BEHAVIOUR AND PHYSIOLOGICAL RESPONSES TO STRESS IN THE ALBINO RAT

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R. TAYLOR and M. SLY

THE effects of gentling and stressing animals on both behaviour and ability of adults to tolerate stress have received considerable emphasis in the recent experimental literature (BERNSTEIN, 1957; BOVARD, 1954; RUEGAMER and SILVERMAN, 1956; WEININGER, 1954, 1956). Both procedures, if introduced in early life, are reported to influence the ability to tolerate stress in later life. WEININGER (1956) found that gentled animals are heavier and the skeletal length is greater than that of non-gentled animals. He also showed that when non-gentled animals were stressed by immobilization, adrenal weight was increased and an increased number of bleeding points was found in the stomach and duodenum. Animals used by WEININGER in his experiments were housed individually.

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In a previous investigation (WINOKUR *et al.*, 1959) we attempted to confirm WEININGER's results, but our animals were housed in groups rather than individually. Our study showed that group housing prevented most of the differences between gentled and non-gentled animals described by WEININGER. Our results showed that handling rats for 5 or 10 min daily from age 23 to 44 days had no effect on body weight or water intake. Differences in body length, tail length and heart size between handled and non-handled animals likewise were not observed following immobilization stress in group housed animals. The only difference consistent with WEININGER's report was, that non-handled animals developed gastrointestinal lesions more frequently after 48 hr immobilization than did handled rats.

A study by RUEGAMER and SILVERMAN (1956) presents data on physiological differences between individually and group housed animals (2 per cage). This study suggests, although the authors did not discuss this point, that group housing decreases the level as well as the number of significant differences observed on such variables as thyroid uptake, carcass length, food utilization and weight gain when gentled and non-gentled groups of animals are compared.

The results of our study and that of RUEGAMER and SILVERMAN suggest that group housing has a protective effect on adult ability to tolerate stressful situations. The present experiment was undertaken to study the effect of differential housing (without the variable of handling) on the stress response.

METHODS AND MATERIALS

Fifty-eight male albino rats were purchased from Sprague-Dawley, Madison, Wisconsin and were 23 days old when received in our laboratory. Animals were randomly assigned to two experimental groups. Twenty-eight were housed individually and 30 were group housed as described below. Animals were handled only during experimental procedures and then weighed at approximately 10 day intervals. At ages 58 and 65 days they were exposed to the enclosed field test.

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On days 82 and 83, 20 of the group housed and 21 individually housed animals were immobilized. Animals were immobilized by taping the forepaws to the body. The animal was then wrapped in gauze, a layer of tape was then applied and covered with plaster of paris bandage. This produced a rigid cast from which animals were unable to escape. No water or food was available during this period. After 48 hr of immobilization, 12 animals from each group were randomly selected, decapitated; and the adrenal glands dissected free. Steroid secretion by the isolated adrenals of each animal was determined (EISENSTEIN, 1956). All evaluations except steroid secretion were carried out on the remaining animals from both groups which had been immobilized. These were weight loss during immobilization, adrenal weights, evaluations of stomach lesions and mucosal colour.

A control group consisting of 8 individually and 9 group housed animals were fasted, deprived of water for 48 hr and decapitated; and all evaluations, other than steroid output were carried out.

Cages. Individually housed animals were maintained in cages 10 in. × 12 in. × 12 in. high with galvanized steel side and rear walls. The floor, top and front of cages were constructed of ½ in. galvanized hardware cloth. A Richter-type graduated bottle supplied water, and a liberal amount of Purina lab chow pellets was present in cages at all times. Faeces and urine dropped into a tray below the cage. Group housed animals were kept in 10 in. × 36 in. × 12in. cages otherwise identical with the individual cages. Richter-type water bottles (four) were affixed to the front of the cages with supplementary bottles on each of the cage sides. Again Purina lab chow pellets were present at all times. Group housed animals were maintained in groups of 15 per cage.

Enclosed field. A 3 × 5 ft piece of plywood painted black and ruled into 12 in. squares constituted the field which was enclosed by a 2 ft high galvanized sheet metal barrier. A 200 watt shielded electric bulb was suspended 4 ft over the centre of the field. Animals were individually introduced into the same corner of the field and their behaviour observed for 2 min. Observations were tabulated each 15 sec and the following aspects of behaviour recorded:

(a) Amount of movement in the field (total number of squares traversed).
(b) Number of different squares entered.
(c) Number of times animal reared—either against a wall or free rearing.
(d) Number of times during each 15 sec period that animal spent more than 7 sec crouching in an immobile position, or extending itself—keeping hind legs in place.
(e) Number of boluses defaecated.
(f) Response to being removed from field.

Adrenal steroid secretion. Both adrenals were removed, dissected free of surrounding tissue, weighed, bisected and placed in 2 ml Krebs–Ringer phosphate-glucose solution, pH 7·4. One unit of ACTH was added and the mixture incubated aerobically for 2 hr at 37° C in a Dubnoff metabolic incubator. Steroid hormones secreted into the medium were recovered and quantitatively determined utilizing a spectrophotometric technique (EISENSTEIN, 1956).

Stomach evaluations. The stomach and a ½ in. section of intestine was removed from each animal and cut open along the greater curvature. The stomach was then gently rinsed in tap water and examined for areas of erosion, increased vascularization, and for the colour of the mocosal lining.

RESULTS

In Table 1 are presented the mean weights; *t* tests showed no significant differences between the groups. Evaluation of enclosed field behaviour is summarized in Table 2 and indicates that significant and consistent (over the two trials) differences in behaviour were observed between group and individually housed animals. Individually housed animals exhibited much less exploration of the field both as measured by the number of different squares entered during the 2 min period as well as by the total number of squares traversed. The individually housed animals showed significantly more crouching and extensor behaviour than was true of the other group. These two categories of behaviour were combined because they appeared to be related (the extensor movements generally followed periods of crouching) and because of the relative infrequency of the latter measure. Significantly more animals in the

individually housed group vocalized (squealed) when they were removed from the field. Significantly more group housed animals defaecated in the field than did those housed individually.

Evaluation of response to stress of immobilization is depicted in Tables 3 and 4 which summarize the results of body weight changes, adrenal weights, adrenal steroid secretion, evaluation for stomach lesions, and colour of stomach lining.

TABLE 1.—COMPARISON OF BODY WEIGHTS

		Weight at age (in days)						
	No.	23	33	43	53	64	74	82
Group housed	30	50·5*	107·2	163·0	235·3	288·1	331·1	357·3
Indiv. housed	28	49·3	108·6	164·6	229·5	292·6	329·4	352·2

* All weights in grammes.

TABLE 2.—ENCLOSED FIELD EVALUATIONS

	Median for group housed	Median for indiv. housed	Median split	*p*	Median for group housed	Median for indiv. housed	Median split	*p*
	Day 58 *Test*				*Day* 65 *Test*			
No. different squares entered	11	3	4·5	0·001*	11	5	9·5	0·001
1st min. activity	11	5	7·5	0·001	13	6	9·5	0·001
2nd min. activity	10	6	7·5	0·05	15	11	13·5	0·05
Total activity	21	11	15·5	0·001	29	17	23·5	0·05
Rearing behaviour	4	1	2·5	0·001	5	2	3·5	0·01
Crouch and extensor behaviour	2	3	2·5	0·05	0	3	1·5	0·05

	Number of animals exhibiting behaviour					
	Group	Indiv.	*p*	Group	Indiv.	*p*
Animals squealed when removed (%)	27	79	0·01	43	82	0·01
Animals defaecated in field (%)	40	7	0·01	60	25	0·01

All *p*'s based on χ^2-tests.

A comparison of weight loss and adrenal weight between animals which were deprived of food and water compared to those which were also immobilized indicates that immobilization produces a significantly greater weight loss than food and water deprivation alone and that it results in adrenal hypertrophy. The comparison depicted in Table 3 is for grouped data, i.e. group and individually housed immobilized vs.

group and individually housed fasted. Comparisons in which the data were not pooled also showed significant differences.

The only other determination which differentiated between group and individually housed stressed animals was the evaluation of stomach lesions. Significantly more animals with gastric lesions were found among those which had been group housed.

TABLE 3.—PERCENTAGE WEIGHT LOSS, ADRENAL WEIGHT, AND STEROID OUTPUT EVALUATIONS

	Immobilized			Food and water depriv. (48 hr)			Immob. vs. depriv.
	Group	Indiv.	p*	Group	Indiv.	p*	p
Weight loss (%)	18·6	18·1	n.s.	14·0	13·0	n.s.	0·001
Relative adrenal weight	18·9	19·4	n.s.	15·6	15·0	n.s.	0·001
Adrenal steroid output†	52·1	52·1	n.s.				

* All p's based on t-tests.
† Micrograms/100 mg adrenal weight.

TABLE 4.—EVALUATIONS OF STOMACH LESIONS AND COLOUR

	Immobilized				48 hr. depriv.		
	Group	Indiv.	χ^2 Criterion	p	Group	Indiv.	χ^2
No. animals with stomach lesions	18/21	5/20	Pres. vs. abs.	0·001	2/9	1/8	n.s.
Colour of forestomach	9*/21	17/20	White vs. yellow	0·01	9/9	8/8	n.s.

* Number of animals with white forestomach.

Stomach lesions were also rated on a 5-point scale which considered size as well as number of lesions. Of five individually housed animals with stomach lesions none was rated 4, two were rated 3, one was rated 2, and two received a rating of 1. Of 18 group housed animals with stomach lesions, eight were rated 4; three rated 3; one rated 2; and six received ratings of 1. Thus, the latter group not only had significantly more animals which developed lesions but more severe lesions were found in this group.

DISCUSSION

Our results indicate that group housing and individual housing of rats produces significant differences in response to a behavioural task as well as differences in response to immobilization stress as measured by occurrence of stomach lesions.

The differences in enclosed field behaviour are interpreted by us to indicate that the individually housed animals behaved in a more "emotional" or "frightened" manner than was true for group housed animals. The following two tenable explanations for the differences in emotional behaviour observed in the enclosed field are proposed.

One is based on the restricted "Lebensraum" of individually housed animals, i.e. they restricted their exploratory behaviour on the enclosed field because of prior restrictions of such behaviour in their home cages. The second explanation is based on the hypothesis that alteration of sensory-motor experiences produces changes in response to stressful situations. The differences in sensory-motor experiences in the present experiment involve the stimulation afforded by animals living in a group rather than in individual cages and the potential locomotor inhibitory effect of being housed in a small rather than a large cage.

If group housing of animals is considered the "normal" habitat then the individually housed animals were subjected to sensory deprivation. It is hypothesized (*post facto*) that the deprived animals respond in a more "stressful" manner to exposure to a lighted enclosed field than do non-deprived or group housed animals.

Within the framework of the first hypothesis one might explain the lower incidence of stomach lesions in the individually housed animals on the basis that it was a less stressful experience for them in that they had been exposed to at least partial immobilization for most of their life while the group housed animals had not experienced such deprivation prior to being immobilized.

The hypothesis cast within the sensory–motor experience framework would have to state that inhibition of activity in stressful situations (as the individually housed animals apparently did in the enclosed field) is not detrimental to organismic equilibrium in all situations, but that it may actually enhance viability in some stressful situations.

Adrenal weight and steroid hormone secretion which are considered good indicators of a stress response do not at first appear to be consonant with an interpretation of immobilization being more stressful for the group housed animals, as the greater incidence of stomach lesions in this group might suggest. Animals which were deprived of food and water but not immobilized had significantly smaller adrenals than the immobilized animals. Thus immobilization was a stressful procedure, but the housing variable neither added to nor detracted from this effect as measured by adrenal weight. Unfortunately steroid secretion was not determined in food and water deprived-only animals so that a comparison of steroid output between immobilized and deprived-only animals was not possible. Another indication that immobilization was stressful is shown by the significantly greater weight loss of these animals as compared to deprived animals.

Individually housed animals could be differentiated not only on the basis of behaviour in the field but also in terms of behaviour variables which apparently had nothing to do with the differential effect of restricted vs. non-restricted housing experiences. When animals had to be handled one could observe more resistance to being handled on the part of the individually housed animals. They would retreat from a hand put into their cage and would squeal while they were being removed from their cage; group housed animals were much less resistant to being handled. Group housing may thus be assumed to have a "gentling" effect, possibly because the greater amount and variety of sensory experiences these animals are exposed to reduce their responsiveness to sensory stimuli incident to handling.

The results of the present experiment thus indicate that handling may be only one of a number of variables that significantly affect the development of stomach lesions. WEININGER (1956) showed that handling of individually housed animals significantly

reduced the incidence of stomach lesions when animals were stressed by 48 hr of immobilization. WINOKUR *et al.* (1959) showed that WEININGER's results could also be obtained with group housed and gentled animals (although they were unable to replicate any of the remaining findings of WEININGER). The present experiment showed that group vs. individual housing in the absence of handling produced similar effects.

SUMMARY AND CONCLUSIONS

(1) Group vs. individual housing produces differential effects on behaviour in an enclosed field, the group housed animals showing more exploratory and less "fearful" behaviour in this situation.

(2) In response to the stress of immobilization (plus fasting) significantly more of the group as compared to individually housed animals develop stomach lesions.

(3) There is no difference in adrenal weight, steroid output of the adrenal or body weight loss between the immobilized animals regardless of whether they had previously been group or individually housed.

(4) Immobilization plus fasting is a more stressful procedure than fasting alone is attested to by the greater weight loss and greater adrenal weights of the immobilized animals.

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EXPERIENCES WITH, AND RESULTS OF, GROUP PSYCHOTHERAPY IN PATIENTS WITH BRONCHIAL ASTHMA*

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INTRODUCTION

IN former publications from this department, GROEN (1953, 1954) described his experiences during the treatment of ten male adult asthmatic patients with group psychotherapy. In these patients the group psychotherapy was supported by the administration of ACTH in dosages depending on the clinical condition. These reports were written when the group therapy had been going on for 2 years (1952 and 1953).

Since then the therapy of these patients has been continued. During the ensuing years, while others left new patients were admitted to the group, so that a total of eighteen male patients with bronchial asthma have now been treated with this form of psychotherapy. As the patients improved, they used ACTH in smaller quantities and most of them discontinued its use altogether, so that during the second half of 1955 only three of the patients took ACTH in quantities of, respectively 5, 10 and 10 units daily.

A second psychotherapeutic group with female asthma patients started its sessions on 1 February 1954 under the direction of H. E. P. At the time of writing the present report fifteen female patients have been treated. During the first 1½ years these patients were treated without ACTH, in order to obtain an impression about the effectiveness of group psychotherapy as the main therapeutic procedure. Subsequently ACTH was administered to some of the patients whose condition seemed insufficiently improved. On the 1 February 1954 four female patients used ACTH in quantities between 10 and 12 units daily.

In this paper the further experiences with the male group and experiences in the female group during the 2 years 1954 and 1955 will be reported.

METHOD

Both groups had two sessions weekly. Every session was supposed to last 1 hr; in actual practice, however, the discussions became animated only after the first 30 min and found their "natural" end after about 75 min, sometimes even later. The male members of the group soon developed the habit of gathering in the waiting room before the beginning of the sessions and beginning a "preliminary" discussion. The female patients used to stay for an "informal" discussion after the withdrawal of the group leader. Many patients went home part of the way together. Some of them visited each other at home in the company of their wives or husbands. These visits and informal discussions may also have had an influence on the therapeutic results.

Both groups were conducted by physicians without specialized training in psychiatry. However, both had some experience with individual psychotherapeutic interview techniques. Moreover, during

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their regular collaboration with the psychiatrists, particularly Dr. J. BASTIAANS, of the Amsterdam psychosomatic research team (GROEN, 1957), they had more opportunity than most internists to become acquainted with the basic principles, indications and dangers of the so-called simple forms of psychotherapy. Both of them had the opportunity to discuss the difficulties occurring in these groups during the staff meetings of the psychosomatic research team. The psychiatrist of the unit was also available for incidental advice.

As the personality of the physician plays an important role in every doctor-patient relationship, it was impossible to obtain absolute similarity of behaviour of both therapists in their respective groups. However, they both kept as closely as possible to the following rules:

(a) Absolute impartiality of the group leader to all members of the group. The physician tried to express in words and in his general attitude that he accepted the individuality of each particular patient in every respect.

(b) The members were encouraged to express themselves freely about any topic they chose, particularly when personal experiences were discussed. The group leader did not hesitate to encourage, for instance, the expression of feeling of rivalry towards other group members, or feelings of self pity, despair or aggression toward husbands, wives, parents, children, against the nursing staff or the group leader himself. Emotional discharges like crying, agitated gesticulations or raising of voices were not suppressed; effective expressions of differences of opinion between the group members were also accepted.

(c) Simple "interpretations" of conflict situations between group members and their environment, or between the group members themselves, given preferably by the members themselves, were encouraged; occasionally they were given by the group leader. The interpretations by the group leader consisted of the verbalization of feelings that seemed only vaguely conscious in the group. Sometimes these feelings were common to all members of the group; in other instances the differences in attitudes of the patients needed further clarification. Some "defence mechanisms" were thus interpreted to the patients in a way acceptable to them. However, whenever the group preferred another interpretation or switched to other topics of discussion, the leader abstained from any effort to force his opinion.

(d) The group leader repeatedly stressed that the object of the sessions was to have a meeting where every member "could be himself" and yet be certain that he would be accepted as such; the group was to be a community where everyone could expect to hear the honest opinion of the others, regardless of whether this comment was pleasant or not.

(e) In general the group leader himself spoke as little as possible (the patients often reproached him for his reticence). On the other hand, it became clear that a too uncommunicative attitude on the part of the psychotherapist either made the patients anxious and insecure, or induced them to imitate him by also not giving themselves away. Thus emerged the general rule of both therapists, never to speak while the members of the group were "communicating" among themselves. The group leader as a rule spoke only when there was a long silence ("What does this silence mean?" or "It seems as if there is something about which for some reason or other nobody wants to speak first"), or if a question was asked by the group (not just by one of its members) about which the members emphatically wanted to hear the doctor's answer; when one or more members tried to change the topic just while an important theme was under discussion, or (mostly towards the end of the session) when the moment seemed favourable for an interpretation of what had been discussed.

The attitude of both group leaders was thus mid-way between a purely analytical (where the therapist hardly speaks at all) and the so called inspiring repressive attitude in which the therapist speaks continuously in a "teaching" manner. The method we used might be called a pedagogical or "tolerant educative" method. It is based on the assumption that in a group which is thus conducted, the members not only identify themselves with their group partners, but also with the group leader who, in the beginning, gives them support, later on encouragement, always assumes a tolerant attitude and is more inclined to reward than to punish.

During absence because of vacation or illness the group leaders usually took over for each other. This gave them an opportunity to become acquainted with each other's methods, and to conform as much as possible to each other's attitudes. During these sessions the patients were allowed and even encouraged to give their opinion freely about the group leader who was not present.

Every session was opened by the individual questioning of each member about his health since the last meeting. From these data, which were completed by physical examination, an impression was

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obtained about the condition of the asthma at the end of each 3 months' period. This opinion was expressed in an index according to criteria laid down in a previous publication (GROEN, 1954). In practice this scale proved to be reasonably satisfactory and reproducible by different investigators.

In the first years the therapists made notes during the sessions. This had the additional advantage of giving the group-leaders—who sometimes felt "insecure" when they were confronted with an unusual situation—an opportunity to gain time by writing and to avoid being overactive in the discussions. Later when the mechanisms which governed the group discussions became clearer, the group therapists also became more confident and felt the obligation to make notes as a burden, so that recently we have employed an assistant to take notes. The presence of the assistant did not appear to disturb the discussions.

During the last year the first writer (J. J. G.) occasionally used psycho-drama to create another opportunity for the members to act out certain emotional situations in the group (MORENO, 1946). These efforts were not continued because the results were inconsistent, a fact which might well be explained by lack of experience with this method.

The patients used for this study were selected from those that had been admitted to the department at least once for severe status asthmaticus; most of them had many admissions for this condition. With only five exceptions they were all very severe cases, many of them elderly intractable cases, especially in the male group.

During the first year the members of the male group were often transported to and from their homes to the sessions by ambulance when they felt unable to come by other means. With increasing improvement and insight the patients began to regard this transport as unnecessary and somewhat humiliating, so that after the first year they hardly ever made use of this facility.

After 2 years none of the patients excused himself for staying at home because of the weather. It was particularly striking that they continued to attend the meetings during rain, snow and mist; many of them even came on bicycles. The female patients were offered no such transport facilities. The greater absenteeism in the female group during its first year may also partly be explained by the difficulty of some of the housewives to find someone to look after the children while they were away.

Nearly all patients used symptomatic remedies in some form or another like aminophylline, adrenaline, isoprenaline or ephedrine, which their general practitioner had prescribed before the patients began to attend the group sessions. The physicians leading the groups allowed continuation of this medication in quantities which the patients themselves determined, although when advice was asked the physician stressed that these drugs were only symptomatic drugs which might even have undesirable side effects. The group repeatedly discussed whether these drugs acted predominantly by their suggestive effect. On one occasion one of the group leaders proposed to put this problem to the test, but his proposal was ignored. The patients attachment to certain powders, tablets, and especially to their adrenaline or isoprenaline spray proved to be very strong. Even those patients who showed considerable progress always carried their medicines with them. They swallowed a tablet or took a few inhalations from their spray even when they had no complaints, "just for safety". During the earlier sessions, it was repeatedly observed that a patient who did not "speak up" when a subject which had great emotional significance for him was discussed, instead took his spray and inhaled a few times.

All patients had been treated with breathing exercises during their stay in hospital. After their discharge, i.e. during the treatment with group psychotherapy the patients had free opportunity to continue these exercises if they wanted, but in spite of the encouragement of the group leader only a few patients made use of this facility, and this only at irregular intervals.

After the group sessions there was always opportunity for the patients to consult the group leader for their bodily complaints. On these occasions they were also physically examined. Blood tests were carried out on those patients who used ACTH. In some patients the excretion of 17-ketosteroids and 17-hydroxycorticoids was followed during this treatment. The result of the physical examination were used in the evaluation of the result of the treatment.

EXPERIENCES

During the first years of observation frequent use was made of the opportunity to obtain personal advice from the doctor. As the patients improved and gained insight into the psychogenesis of their disease the number of demands for individual examination steadily decreased. During the first years several patients tried to have confidential talks with the leader outside the group. In the male group this sometimes caused considerable difficulties, because it became clear during the sessions that some patients had confided secrets to the physician which they had not communicated to the other members. The physician declared himself bound by professional secrecy which he would only give up if the member in question himself wanted to bring the matter into the group for discussion. After two incidents of this kind (in both cases in elderly patients who seemed to have greater difficulty in discussing their secrets in a wider circle) a number of younger members protested. They said that such "separate" interviews would harm the spirit of the group as a unity, after which the group decided to stop the separate confidential talks with the group leader and discuss all their problems together.

In one of the former reports (GROEN, 1954) we described how the topics for discussion in the male group seemed to come up in the group in an almost regular sequence. This was confirmed in the female group. The "regression" phenomena which we described there was also frequently observed in the female group.

In the male group, during the last 2 years, a general opinion emerged that the cause of asthmatic attacks was "an impossibility to express irritation, often about futilities, which, however, had a deeper background and which for this reason one could not overcome". Some members stuck to the opinion that, being a patient, they had a right to expect more consideration from the people in their environment than others. Other patients reached the insight that they themselves were often irritable and difficult for their environment. These members began to discuss how they could improve themselves, but still blamed their wives for not understanding them, or giving them an opportunity to talk things over.

In the female group there was much less unanimity of opinion in this regard, just as had been the case in the male group during the first 2 years, so that the women still spent much time in discussing whether the attacks were due to a cold, to hypersensitivity to dust and food or—as a few patients maintained—to difficulties in their life situation. In this regard there was an obvious similarity in the developemnt of both groups. In both cases it took about 2 years before the patients began consciously to discuss the possibility and mechanism of a psychogenesis for their attacks. We do not know whether this long time interval was caused by the imperfection of our therapeutic technique or by the strong resistance in accepting a relationship between emotional factors and bodily disease which predominates in our culture in general, and perhaps in asthmatic patients in particular. However this may be, an increasing attitude of introspection in the male group enabled the leader during the last 2 years to give more interpretations than was practicable in the female group. In the male group the patients asked their leader's opinion or advice about difficult life situations rather frequently, whereas requests for symptomatic anti-asthmatic therapy which were common during the first 2 years of this group became rarer. This was much less so in the female group.

It was striking that two topics were hardly ever discussed, viz. sexuality, and fear

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of death. Fear of death was, in fact, experienced by the patients, as could be plainly observed during severe attacks, especially after some patients in the male group had died. During the sessions after these events, the patients blamed the group-leaders and doctors in general, who had made them believe that asthma patients never die in an attack. During these sessions the patients also admitted that the fear of dying could make the dyspnea worse or could even produce an attack. But after these events or their own attacks were over, the patients seemed to "forget"—or to repress—this fear of death quickly and did not discuss it again.

The avoidance of topics related to sex was especially conspicuous in the male group. Attempts by the group leader to introduce the subject were ignored, or caused reactions which showed the severity of the psycho-sexual immaturity in these men. Of eighteen male patients, seventeen were married, but only six had regular sexual intercourse with their wives. The elder members admitted that intercourse had also been infrequent when they were younger. They regarded their wife mainly as a protecting or serving person from whom they expected loving care, understanding and adaption to their wishes. Only two male patients were promiscuous and only one of them discussed his promiscuity in the group. The group was greatly shocked by his story, and many members appealed to him to give up his extramarital relation.

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During a few interviews with the wives of the male patients the impression was obtained that the dominant role which these women played in the marital situation had for the greater part been induced by the attitude of the husbands themselves. Some of the wives plainly stated that they lacked support and protection "such as any woman expects from a man"; two wives were consciously disappointed by the lack of sexual libido in their husbands. In some cases it seemed as if the marriage had resulted from the encounter of an asthmatic patient seeking protection, and a woman inclined to assume a dominant role. The result was an "inverted" marital relationship, which left both partners unsatisfied; it pushed the wife into an increasingly aggressive dominance, whereas the male who felt frustrated in his craving for a tender and loving protection, reacted by an apparent submissive attitude, which, however, was accompanied by an exacerbation of his asthma. None of the patients was able to solve this difficulty by discussing it with their wives or by a "natural" male preponderance, but it seemed to do them good when they could complain in the group about this 'lack of warm hearted understanding', as it was frequently formulated. If a patient succeeded in finding support and understanding for his situation in the group, it seemed immediately to affect his asthma favourably, as appeared from his report at the next session. If, however, the others disagreed or advised him "not to take it any longer" (an advice which was hardly ever followed), this had either no effect or was definitely unfavourable for the disease.

In the female group thirteen of fifteen patients were married or had been married; ten of them were frigid. This was discussed in the group. Sexual subjects were discussed more often in the female than in the male group, often in relation to the feelings of the patients regarding the group leader. "I wish I had a husband who understood me like you do", was a frequent expression. In general, although the female patients dared to discuss sexual matters more than the males, they usually did so in a negative way: "Men only want you to sleep with them, but you cannot talk with them, and they do not understand a woman". Like the male patients, these wives wished that

their husbands showed a more kind and loving attitude towards them. Above all they wanted to be understood in their sensitivities.

Like the male patients the females requested special care and understanding from their husbands when they were ill. Both male and female patients wished their spouses to stay either at their bedside or at least in an adjoining room when they had an attack. To leave the house, i.e. for a family visit, when the patient was ill, was experienced as a desertion and caused severe frustration. An increasing indifference of the spouse to their chronic illness was a common grievance of both male and female patients.

Two further events which occurred during the few years of the group psychotherapy deserve mentioning, although we are not sure that they were actually related to it.

In the first place a number of patients from the male group decided to found a Netherlands Society of Asthmatic Patients. As might have been expected, and as has been observed frequently in associations of this kind, the foundation and organization caused considerable difficulties, as well as providing difficulties in the interhuman relationships of the members. Some members of the group played a leading role in this association from its onset; other patients did not feel attracted to the work in committee meetings, etc. It was therefore agreed that the group sessions would not be used to the vicissitudes of the Society, but that the personal experiences of the members should continue to be the main subject of the group discussions. For the same reason the physician leading the male group resisted the request of the Society to play a leading role as their advisor. However, after the teething difficulties were overcome, the Society's membership has grown and has spread all over the country. To those who had known those patients at the beginning of the group psychotherapy as severely ill, often egocentric persons, it was most gratifying to see how the same people conquered the first difficulties connected with corporate life, obviously inspired by a common ideal. Their asthma, after some ups and downs, seemed to derive additional benefit from the success of the Society.

It gradually became clear to both group leaders that they themselves were influenced by the group sessions. In the beginning they often found it difficult to remain tolerant, understanding and friendly, when, as has often been the case in the beginning, negative feelings of discontent and aggression were expressed in the groups, and all kinds of opinions that differed considerably from those of the group leaders were freely expressed. They both found it difficult to listen passively and outwardly quiet to these emotional discharges, to accept severe criticism of doctors and nurses in general and of their own hospital, without getting even the slightest support from any of the group members. The continuous "regressions" into all sorts of resistance was also a trial to the group leaders. Both felt the need to discuss with others the emotional stresses which the group sessions caused to them. This was usually done during the staff meetings of the psychosomatic research team. Thanks to the tolerant attitude of the psychiatrist of the team, Dr. J. BASTIAANS, both groups leader could discharge their own aggressions outside the therapeutic groups and in a different form, so that with a few exceptions, the group leaders were able to maintain a tolerant and educative attitude towards the patients. During the staff meetings the other members of the team began to show great interest in the reports on the group sessions; they began to pay increasing attention to group behaviour in general, and gradually the staff meetings themselves changed in character. Emotional tensions among the staff members were more freely expressed during the meetings, and before long it became apparent that the co-operation between the members of the psychosomatic team and their mutual criticism became easier. It was probably not a mere coincidence that during these same years joint staff meetings of the whole personnel of the Second Medical Service of the Wilhelmina Hospital was started. During these joint staff meetings, which were conducted by the physician-in-chief of the department (J. J. G.), the daily and general "policy" of the department were dealt with in weekly meetings, attended by the entire medical, nursing, laboratory and other auxiliary staff. Modern industrial psychology has shown the great importance of the team "spirit" among the small group of top leaders for the spirit among the entire staff, including the lower ranks of the institutions. That the group psychotherapy of patients would influence the team spirit among the doctors, and through these, of the entire medical, nursing and laboratory staff of the department was an unexpected experience.

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The sessions of the male group were now and then attended by visiting doctors who were interested in group psychotherapy. The presence of such a visitor hardly ever influenced the discussions.

A demonstration of a group session was given on four occasions: before the Medical Society of Amsterdam, the Netherlands Association of Hospital Matrons, the psychotherapeutic society, and for a class of medical students of the University of Amsterdam, during a course in psychosomatic medicine. Only one of these demonstrations was seriously disturbed by the unfamiliar environment; and in the other three it was surprising to observe how, after some initial inhibitions, the discussions got going and went on almost naturally following the same pattern as usual.

RESULTS

The results of the first 2 years of treatment in the male group have been presented in the previous publications (GROEN, 1953, 1954). In these papers comparison was made with three other groups treated, respectively, with symptomatic therapy only, with ACTH only, and with individual psychotherapy. Although the number of patients was small, the results of group therapy compared favourably with those in the other groups. This classification is not satisfactory for the present survey because the administration of ACTH in the male group decreased continually so that by the end of the 4 years' period only two patients used this preparation in small quantities of, respectively, 5 and 10 units per day. Moreover, the control group treated with individual psychotherapy only was dissolved, and could not be used for the present comparison. We prefer therefore to present the results as a comparison of the following three groups:

Group I: patients treated with symptomatic therapy only.

Group II: patients treated with symptomatic therapy and ACTH.

Group III: patients treated with group psychotherapy, if necessary combined with symptomatic therapy and (or) ACTH.

The data were compiled as follows. From the files of the Second Medical Service all patients were selected who had been admitted for bronchial asthma between January 1951 and January 1956. This comprised a total of 165 patients. Three of these died during their first admission. Because these three patients could not be treated with group psychotherapy we left them out of this survey as their classification in group I might unduly "flatter" the results obtained in group III by group psychotherapy. During 1956 we conducted a follow-up study on the remaining 162 patients, which was concluded on 1 February 1957. No data about the state of health could be obtained from 15 patients, either because their present address could not be traced (4 cases) or because they did not answer our repeated request for further information or the announcement of our visit (11 cases). In this way information was obtained about the present state of health of 147 patients (81 men and 66 women). The data about their state of health were obtained by follow-up examination by one of the staff physicians (111 patients), in some cases by visits to the homes of the patients by a licenced nurse whom we trained specially for this follow-up study*. Out of the 147 patients, 33 (18 men and 15 women) were treated by group psychotherapy whereas

* We are indebted to Dr. J. M. VAN DER VALK, Mr. L. J. BARENDSE and Miss A. SNOEP, both nurse and social worker, for their co-operation in this part of the study.

114 patients (63 men and 51 women) received no group therapy. These 114 patients served as the control group, treated by symptomatic therapy alone (group I).

Group II is composed of 35 patients treated in the section for Pulmonary Diseases of the University Depatrment of Medicine of the Academic Hospital in Groningen during a 4 years' period, between July 1952 and July 1956. The patients were treated for periods varying from 3 months to 4 years with ACTH, cortisone or prednisone. The results of this treatment were kindly put at our disposal by Prof. Dr. N. G. M.

TABLE 1.—RESULTS OF THREE FORMS OF THERAPY FOR BRONCHIAL ASTHMA

Therapy	No. of cases	Clinically cured	Considerably improved	Temporarily improved or stationary	Worse	Died
(I) Symptomatic	114	2	17	45	17	33
		19			50	
(II) TH or cortisone (Prof. ORIE)	35	3	7	9	7	9
		10			16	
(III) Group psychother. (+ sympt. and ACTH if necessary)	33	3	21	4	1	4
		24			5	

ORIE.* The three groups are comparable as regards social class, sex distribution and the severity of the disease. There was, however, some age difference in the mean age, the average years of birth were 1906 and 1907 in groups I and II, respectively, but 1911 in group III. Statistical analysis showed that this difference was just significant at the 5 per cent level with a t value of 1·65. This difference might have favourably affected the mortality in group III (the experimental group). This must be taken into account when group III is compared with the other groups, as will be done below.

The results are presented in Table 1: Table 2 gives the results in percentages.

From the comparison of the results in the different groups, it can be concluded in the first place that our group psychotherapy has not prevented the loss of 4 patients, 3 of whom died from asthma. One patient who had shown considerable improvement in his asthma died from a carcinoma of the pancreas. Because the cause of death in the other groups was not known with certainty for all patients, it is possible that there were also patients who died from other causes than asthma in the other groups. For this reason a comparison can only be made on the basis of the gross mortality figures. The mortality among the patients treated with group therapy was 12·1 per cent; in the two other groups it was 28·9 per cent and 25·7 per cent, respectively. The differences are significant. Combining groups I and II would increase the statistical significance.

* We are much obliged to Prof. Dr. N. G. M. ORIE for his permission to use these results for comparison.

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We would hesitate, however, to attach importance even to a statistically significant difference between the treated and control groups, because apart from the difference in age, we are not sure if the observation periods in the three groups can be considered comparable. The group psychotherapy started in the male group on the 1 November 1953. In the course of the 4 years of observation, new patients were admitted so that some patients have been under observation longer than others. In groups I and II the observation period was at least 1 year; in group III the observation period varied

TABLE 2.—RESULTS OF THREE FORMS OF THERAPY FOR BRONCHIAL ASTHMA (IN PERCENTAGES)

Therapy	Clinically "cured"	Considerably improved	Temporarily improved or stationary	Worse	Died	"Index of Benefits" (% improved minus % deteriorated)
(I) Symptomatic	1·8	14·9	39·5	14·9	28·9	
	16·7			43·8		−27·1
(II) ACTH or cortisone (Prof. ORIE)	8·6	2·00	25·7	20·0	25·7	
	28·6			45·7		−17·1
(III) Group psychother. (+ ACTH or sympt. if necessary)	9·1	63·7	12·1	3·0	12·1	
	72·7			15·1		+57·6

Significance of the differences in distribution (Wilcoxon):
Group II better than I, $t = 0{\cdot}75$ not significant.
Group III better than I, $t = 4{\cdot}10$ $p = 0{\cdot}00005$
Group III better than II, $t = 2{\cdot}90$ $p = 0{\cdot}0004$

between 1 and 5 years for the male group and between 1 and 3 years for the female group. The importance of the length of the observation period is illustrated by the fact that in the male group there was no mortality after 2 years, which contrasted very favourably with the already considerable mortality in group I and II at that moment. But in the second period 4 patients died. LEIGH's (1953) criticism that all existing statistics about the effect of psychotherapy on asthma are unreliable because the observation period was too short applies strictly speaking also to the (at first sight) impressive difference in mortality in favour of the group psychotherapy that seems to follow from our figures.

Besides the 59-year old patient who died from carcinoma of the pancreas (confirmed by autopsy), 3 patients died from asthma, 2 during status asthmaticus, and 1 from corpulmonale and psychosis, at the ages of 55, 64 and 68 years, respectively. All these elderly patients not only suffered from a very severe form of the disease, but the relationship with their wives and their social situation were also unfavourable.

In two cases, the relations with the wife were strongly ambivalent; both patients were partly dependent, partly protesting in their attitude towards their strongly dominating spouses. The third patient was divorced, but still quarrelled with his former wife about the alimony; he had a strongly ambivalent attitude towards his present landlady, a dominating woman on whom he depended, although he knew she was after his money. (During his admission to hospital she induced him to make a will entirely in her favour.)

Two of the men were unemployed and found no satisfactory substitute for work so that they lacked an adequate outlet in any hobby, social or physical activity. The third worked, but was in a severe conflict with his chief, a former friend, who had dissuaded the patient from marrying his present wife. He developed strongly ambivalent feelings towards this man in which his wife was also involved. Shortly before his death he also became involved in a conflict between his wife and his only daughter by his first marriage. All three patients died following an acute exacerbation of their emotional conflicts, which they did not want or dare not discuss in the group.

It was remarkable that death occurred quite suddenly in 2 of these 3 cases. Both patients had improved after they joined the group discussions, at least the frequency of the attacks decreased, but the attacks when they returned were unusually severe. Both had their fatal attack at a moment when our department had no free beds. One patient was admitted by mistake to another hospital, and the other one was informed by telephone that he could only be admitted the next day. It may be that these disappointing events, experienced by the patients as a shortcoming of the group leader, meant an additional conflict for them.

If we now direct our attention to those patients who became worse, it is striking how few of the patients undergoing group therapy were so affected. Only 1 of the 33 patients treated with group psychotherapy became worse (3 per cent). This was a woman who was repeatedly admitted to other hospitals because there was no place in our own department. During these admissions her attendance at the group meetings became impossible but this also disrupted her ties with the group.

In the control groups 15 and 20 per cent, respectively, showed a progression of the disease. The low figure for unfavourable progression of the disease in the patients treated by group psychotherapy supports the impression that the group discussions whatever may have been their positive effect on mortality, at least prevented a progression of the disease. The combined percentage of progression and death in the group treated by psychotherapy was 15 per cent, as compared to 46 per cent in the group treated with ACTH and 44 per cent in the group treated with symptomatic therapy only. These figures make us realize how unsatisfactory the treatment of severe asthma by the usual methods still is, at least for those patients who are so severely ill that they are admitted to a hospital.

The positive results show great differences between groups. In the group treated with psychotherapy the percentage of patients clinically cured or considerably improved was 73 per cent as compared to 17 and 29 per cent, respectively, in both control groups. This difference is significant. Table 2 also gives the "index of benefit" of the three forms of treatment. By this we mean the percentage of patients who are clinically cured or considerably improved, minus the percentage of those who got worse or died. For group psychothrapy this index is positive: +58 per cent; for treatment with ACTH and cortisone the index is −17 per cent and for symptomatic therapy as low as −27 per cent. These differences are strongly significant in favour of the group therapy.

In order to compensate for the age difference between group III and group I which may have been favourably influenced the mortality in group III, we have also compared the results in the three groups by a method of "matched controls". The psychologist of

our department, Dr. J. T. BARENDREGT, who did not know the patients personally, selected from two lists containing only the names, sex and age of the patients, for every individual of group III (total 33 patients) two corresponding individuals of group I (total 114 patients). A second investigator then filled in the data on the condition of the control patients. Table 3 presents the results in percentages. The survival rate now appeared to be indeed somewhat more favourable in group I so that the difference in mortality between group I and III, although still considerable, is no longer significant.

TABLE 3.—RESULTS OF THREE FORMS OF THERAPY FOR BRONCHIAL ASTHMA
(in percentages)
(Compared by method of matched controls chosen from group I)

Therapy	No. of cases	Clinically "cured"	Considerably improved	Temporarily improved or stationary	Worse	Died	"Index of benefit" (% improved minus % deteriorated)
(I) Symptomatic	66	1·5	15·1	45·5	16·7	21·2	
		16·6			37·9		− 21·3
(II) ACTH or cortisone	35	8·6	20·0	25·7	20·0	25·7	
		28·6			45·7		− 17·1
(III) Group psychother. (+ ACTH or sympt. if necessary)	33	9·1	63·7	12·1	3·0	12·1	
		72·8			15·1		+ 57·7

Significance of the differences (Willcoxon):
Improvement in group III significantly more than in group I : $t = 4{\cdot}6$ ($p = 0.00005$).
Mortality in group III smaller than in group I, but difference not significant : $t = 1{\cdot}32$ ($p = 0{\cdot}14$).

But the total picture and the "index of benefits" of the therapy still differ significantly.

We wish to emphasize, however, that even this statistical significance should not lead to an overestimation of the value of our figures. We also wish to withhold an interpretation of the mechanisms responsible for the successes of the group therapy. It is quite possible that these successes were due not only to the discussion in the group, but to the simple fact that these patients, in addition to the help they received from the family doctor could also come to our department twice a week. Against this seems to be the observation that several patients did not attend the sessions for weeks or even months, without any appreciable influence on the therapeutic results. They knew, however, that they could always return to the group when they wished to do so, and that they could always find a doctor there who would be entirely at their disposal.

COMPARISON WITH THE RESULTS OF GROUP THERAPY BY OTHERS

In the available literature we found only a few reports on the treatment of asthma patients by group psychotherapy. BARUCH and MILLER (1947) and MILLER and BARUCH (1948) treated a group of allergic patients, including some asthmatics, and

reported favourable results; the results in the asthmatics are not stated separately and there was no control group. STOKVIS and WELMAN (1955) published favourable results of short term (2 months) treatment of a very small group of five asthma patients. These patients were treated during their stay in hospital, they were not followed up, and there was no comparison with a control group, so that these results cannot be compared with ours.

After we had been engaged in group psychotherapy for some time, we found out that Dr. SCLARE in Glasgow had independently started a therapeutic experiment with a group of asthma patients. At the Second European Conference of Psychosomatic Research (1956) we had an opportunity to exchange our experiences. There appeared to be a remarkable similarity in the behaviour of the groups and in the subjects which were discussed by the patients. The results which SCLARE and CROCKET have since then published (1957), differed from ours, however. From the psychiatric point of view they found a definite improvement in the patients' behaviour and in the ways they managed their neurotic conflicts, but the internist who assessed the patients for their asthma could find no more objective improvement in the treated than in the control groups. This difference in results may have been caused by the fact that the Amsterdam groups were guided by two internists whereas the group in Glasgow was conducted by a psychiatrist. This means that the patients in the group in Amsterdam could obtain, both during and after the group sessions, advice for their symptomatic treatment from the same doctor who conducted the sessions and who during the first years also gave them ACTH when necessary. In Glasgow the somatic treatment was conducted by another physician. We suppose that the fact that the whole treatment remained in the hands of one doctor may have caused an improvement both in the transference situation, and in the somatic results of the therapy. This suggestion is supported by the following observation. Simultaneously with the male group reported in this paper, a control group was started which was guided by a psychiatrist* as in the Glasgow experiment. One of us (J. G.) was in charge of the somatic treatment and observation of the patients in this "psychiatric" group. In the beginning the results in both groups seemed to be comparable, but in 6 months a definite difference could be observed, and after 1 year the sessions in the psychiatric group were stopped because of the absenteeism of too many patients.

Recently LANGE NEILSEN and RETTERSTOL (1959) reported their preliminary experience with the psychotherapy of ten patients who were treated in a group in which both an internist and phsychiatrist participated. Their observation on the persistence of the patients confirmed the experiences of SCLARE and CROCKETT and ourselves. They summarized their results as "a slow advance".

The conclusion that the patients in our groups not only improved in their somatic disease, but also in their psychic attitude and behaviour, is not only supported by the impression of the group leaders and of the spouses of the patients, but was also confirmed by Dr. BARENDREGT, the psychologist of the psychosomatic research group in Amsterdam, who found a statistically significant change in the Rorschach responses of the patients treated by group therapy in comparison to a control group selected at random from the patients who had been treated with symptomatic therapy only (BARENDREGT, 1957 a, b).

* We gratefully acknowledge the co-operation of our psychiatric colleagues R. H. DE BEL and H. BEIMA.

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CONCLUSIONS

(1). Group (discussion) therapy was found to be a valuable adjunct in the treatment of bronchial asthma.

(2) The guidance of such a group by a non-physchiatrist proved to be feasible, at least when expert psychiatric advice was available to the group leaders for the various problems which occurred during the treatment.

(3) The principles of this group psychotherapy were similar to those used in the treatment of psychoneurotic and psychopathic patients. The same phenomena were observed in the dynamics of the group. Identification with, and rivalry between the patients and towards the group leader, the choice of topics for discussion, resistances and transference situations were essentially similar as described in other psychotherapeutic groups. The leader must, however, be constantly aware of the danger that conflicts between the patients or with the group leader may not only cause interhuman reactions and emotional discharges, but may also give rise to attacks of asthma, which may be severe. This limits the possibilities with which the principle of the re-enacting of conflict situations in the group can be applied to these severely ill patients.

(4) Only three patients seemed to be clinically "cured" in so far as they were completely free from attacks during two consecutive years. In each of these cases there was also an important change in the general life situation which occurred during and in connexion with the group psychotherapy, viz. by emigration to Australia, by a happy marriage (in both cases leaving the conflict-laden parental home) and, in the third case, by divorce followed by a better second marriage.

(5) Nearly all the patients improved more or less during the treatment. The improvement manifested itself particularly by longer intervals between the attacks. The patients also seemed more able to overcome common "colds", without suffering attacks of asthma. In several patients absenteeism from work was also reduced. Some of them, who were about to be dismissed by their employers as invalids, could resume their work. The undiminished attendance at the group sessions during cold, stormy or foggy weather provided a remarkable indication of their improvement. After a time many patients even took pride in attending the sessions under all weather conditions.

(6) In some patients an improvement could also be observed in the way in which they handled interhuman conflicts. This strongly depended on the support, understanding and co-operation which they received from their wives or husbands, and from their employers. Those patients who showed most improvement in their interhuman relations were also benefitted most as regards their asthma.

(7) In some patients whose environmental situation did not improve, or became worse, the attacks returned, sometimes after an initial impressive improvement. Such an exacerbation was sometimes of minor importance, but sometimes it was so severe that the patients had to be readmitted in status asthmaticus.

(8) Three male patients died from asthma. In every case this occurred following an acute excerbation of a serious conflict which they could not avert or overcome and which they either did not want or dare to discuss in the group, or when they were not given an opportunity to do so. These three patients were elderly men of 55, 64 and 68 years, respectively. A fourth patient died from another cause.

(9) During an observation period of 2 and 4 years, respectively, with bi-weekly controls, not a single attack was observed which could be ascribed to allergy in one form or another. Most attacks appeared to follow frustrations in interhuman

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relations; for a minority of the attacks no explanation was found. This seems to indicate that the hypersensitivity which was shown to be present in some of these patients by means of skin and inhalation tests is of small importance as a cause of their "spontaneous" attacks. It was especially remarkable that in those patients who were hypersensitive to house dust, remissions were no less frequent and certainly of no shorter duration than in the other patients, although they continued to live in the same homes and were not desensitized.

(10) During the periods of remission, almost all patients continued to use several symptomatic remedies like aminophylline or isoprenaline. Several patients discussed in the groups the fact that the effect of these medicines might be entirely due to suggestion and gave examples of attacks that started at the very moment when they perceived that they were short of nebulising fluid. These attacks sometimes stopped when the patient stood before the drug store counter asking for his remedy. However, hardly any patient was able to break these deep-rooted habits, and the group leaders preferred not to insist too much on this point. Fourteen of eighteen male patients used ACTH at one time or another during the observation. This number was reduced after 4 years to only three patients who took 5, 10 and 10 units of regular ACTH, respectively. This decreasing use of ACTH was accompanied by an improvement in the asthma. In the female group a similar tendency was observed after six months to stop ACTH when it was no longer necessary. The main advantage of ACTH seemed to lie in its ability to stop an incipient status asthmaticius at home. This has considerably contributed to the low re-admission rate in the male group, where only two patients had to be admitted during the last year of the experiment.

(11) During the observation of our groups we found that the following factors were indicative of a bad prognosis:

(a) Advanced age. Deaths occurred only in patients over 55 years of age.

(b) The fact that the patient had been admitted to a hospital for the treatment of his asthma. Especially frequent re-admissions seemed to carry a bad prognosis. The patients who died also distinguished themselves in this respect; all of them had been admitted at least three times.

(c) Unfavourable marital situations or disturbed relationships with children or other key figures in the nearest environment.

(d) Unemployment or unfavourable relations with the employer or other authorities at work.

(e) Inability or unwillingness to act out an unrestrained behaviour in the group. the prognosis proved to be very unfavourable in those patients who told lies in the group, or who deliberately concealed certain facts when the other group members asked them questions. This not only deprived these patients of the support of the group, but added another interhuman conflict to their problems: a conflict with the group or its leader.

(f) Lack of introspection, especially when combined with resistance towards the acceptance of a casual relationship between life situations and asthma.

(12) The prognosis seemed to be favourably affected by the following factors:

(a) Youth.

(b) Asthma in such a degree that no hospital admission had been necessary.

(c) A marital partner who could accept the patient as he or she was, and a satisfactory relationship with the rest of the family, including the children.

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(d) A satisfactory work situation.

(e) The ability to speak or act out in the group personal conflicts on an emotional level.

(f) Good introspective ability and a certain satisfaction derived from the acknowledgement of the role of interhuman conflicts and their handling as a possible cause of the attacks.

(13) Although both physicians and patients obtained a favourable impression of this form of treatment as judged by the significant clinical results, the reduced absenteeism from work and the reduced admission to hospital, it must be stressed that three out of thirty-three patients who had been treated with group psychotherapy died from asthma within 4 years. (In the control group thirty-three out of the 114 patients died, whereas only three patients appeared clinically "cured"). It is hard to decide if this still unfavourable part of our results is due to insufficient skill on the part of the group leaders or if these observations lead to the conclusion that further improved methods will have to be developed for the psychotherapy of asthma.

(14) In view of the important role which both the wife (or husband), and boss of the patients seemed to play in the course of this disease an improvement of the therapeutic results might perhaps be expected from a combination of group therapy with some form of socio-therapy directed to the family and work situation.

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SUMMARY

The writers report the results of a therapeutic trial with eighteen male and fifteen female asthma patients who were treated with group psychotherapy combined, if necessary, with ACTH and symptomatic therapy over a period of 4 and 2 years, respectively. The results were compared with two control groups, who were treated, respectively, with symptomatic therapy only, and a combination of symptomatic therapy and ACTH. Although a significant difference was found in favour of the patients treated by group psychotherapy (supporting the hypothesis that psychic factors play a role in the causation and course of the disease) the results are not yet entirely satisfactory. Further intensive research will be necessary to find more effective methods of treatment in this disease.

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PSYCHOLOGISCHE UNTERSUCHUNGEN AN FRAUEN MIT SOGENANNTEM IDIOPATHISCHEM HIRSUTISMUS (A PSYCHOLOGICAL INVESTIGATION OF WOMEN WITH SO-CALLED IDIOPATHIC HIRSUTISM)*

A. -E. MEYER, M.D. und D. v. ZERSSEN, M.D.

A. PROBLEMSTELLUNG

WÄHREND umfangreiche psychiatrische Untersuchungen an weiblichen Scheinzwittern vorliegen (ZÜBLIN, 1953a, b; HAMPSON, 1955; MONEY *et al.*, 1955; WALLIS, 1958), fehlt es an entsprechenden systematischen Untersuchungen an Grenzfällen viril stigmatisierter Frauen. Solche Fälle sind aber naturgemäss viel häufiger. Ihre sinnfälligste Form ist die als idiopathischer oder gewöhnlicher Hirsutismus bekannte virile Behaarungsform der Frau. In den letzten Jahren sind zahlreiche Publikationen über die endokrine Grundlage dieser Anomalie und die Möglichkeiten einer hormonalen Therapie erschienen (z.B. JAILER und VAN DE WIELE, 1954; KAPPAS *et al.*, 1956; PRADER in LABHART, 1957; PERLOFF *et al.*, 1957, 1958; GALLAGHER *et al.*, 1958; BUSH und MAHESH, 1959; VAGUE *et al.*, 1959). Nach den wenigen in dieser Literatur verstreuten Angaben über psychische Auffälligkeiten hirsuter Frauen zu urteilen, ist die männliche Behaarung oft Ursache seelischen Leids (PRADER in LABHART, 1957). Nach Angaben von VAGUE *et al.* (1959) sollen psychische Störungen in Form vegetativer Dystonien und Charakterstörungen sehr häufig sein und der körperlichen Umwandlung sogar manchmal vorausgehen. Es liegen auch Berichte vor, in denen von einer psychoreaktiven Auslösung des Hirsutismus (MERIVALE, 1951; BUSH und MAHESH, 1959) oder gar von einer eigentlichen Psychogenie (ROTTINI und ANTONELLI, 1959) gesprochen wird.

Unsere Untersuchung verfolgte das Ziel einer möglichst vollständigen Erfassung des psychologischen Querschnittsbildes und der lebensgeschichtlichen Entwicklung von Frauen mit gewöhnlichem Hirsutismus zur Klärung folgender Fragen:

(a) Besteht häufig ein Leidensdruck und bei welchen Frauen? Worauf beruht er?

(b) Kommen darüberhinaus psychische Störungen vor und welcher Art sind sie (angeborene Anomalie, endokrines Psychosyndrom oder psychisch-reaktive Störungen)?

(c) Finden sich Anhaltspunkte für eine emotionelle Auslösung des Hirsutismus, evtl. in einem spezifischem Sinne, d.h. dem einer eigentlichen "Psychogenie"?

(d) Welche Beziehungen bestehen zu der schon erforschten Psychologie des adrenogenitalen Syndroms (AGS)?

B. UNTERSUCHUNGSGUT

Von einer Gesamtheit von 42 Fällen, bei denen im Zeitraum von 1951 bis 1958 an unserer Klinik ein gewöhnlicher Hirsutismus diagnostiziert wurde, stellten sich 15

* Aus der II. Mediz. Klinik und Poliklinik des Universitätskrankenhauses Hamburg-Eppendorf (Direktor: Prof. Dr. A. JORES). Diese Untersuchung wurde ermöglicht durch die finanzielle Unterstützung der Deutschen Forschungsgemeinschaft, der wir an dieser Stelle unseren besten Dank aussprechen möchten.

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Fälle für eine umfangreiche stationäre Untersuchung zur Verfügung. Sieben davon befanden sich z.Zt. der Untersuchung sowieso zur stationären Abklärung ihres Hirsutismus oder wegen einer anderen Erkrankung in unserer Klinik, die übrigen 8 kamen einer schriftlichen Aufforderung nach.

Die primäre Motivation, einen Arzt aufzusuchen, der die Klinikeinweisung veranlasste, war nur bei 5 der 15 Patientinnen allein ihr Hirsutismus, bei 2 weiteren der Hirsutismus in Verbindung mit anderen Beschwerden (homosexuelle Impulse bzw. Regelstörungen und Angstzustände), die restlichen 8 Pat. suchten—wenigstens bewusst—nur mit anderen Beschwerden einen Arzt auf (z.B. Ermüdung und Kurzluftigkeit; Migräne; Fluor vaginalis; Sterilität; Angstzustände bei Hypertonie und Adipositas u.a.).

Es handelte sich um geschlechtsreife Frauen im Alter von 19 bis 37 Jahren aus verschiedenen Schichten der Bevölkerung, die zur Zeit der Untersuchung nicht an schweren akuten oder invalidisierenden chronischen Körperkrankheiten litten. Unsere Stichprobe von 15 Fällen kann nach den wichtigsten biologischen und soziologischen Daten, die in Tabelle 1 zusammengestellt sind, als repräsentativ für die Gesamtheit der 42 Fälle unseres Klinikkollektivs angesehen werden (lediglich scheinen relativ zu wenig Angehörige der Oberschicht erfasst zu sein; doch ist die Zuordnung der Einzelfälle in der Rubrik 'sozialer Stand' sowieso problematisch, da dafür keine anerkannten Maßstäbe vorliegen). Die Fallzahl reichte aus, um einige der wichtigsten psychologischen Aussagen statistisch zu sichern (Einzelheiten des statistischen Vorgehens werden an anderer Stelle besprochen: v. ZERSSEN, 1959).

Alle 15 Pat. wurden während eines stationären. Aufenthalts von mindestens 14-tägiger Dauer körperlich gründlich untersucht (einschliesslich anthropometrischer und gynäkologischer Untersuchung, radiologischer Untersuchung des Skeletts und biochemischer Harnanalysen, siehe V. ZERSSEN, *et al.* (1960) und AHRENS (1960).

C. METHODIK

Alle Pat. wurden zusätzlich zur üblichen Anamnesenerhebung eingehend exploriert (M.) und einer Reihe psychologischer Tests unterzogen (v.Z.).

Die Exploration erfolgte nach allgemeinen psychiatrischen und tiefenpsychologischen Gesichtspunkten und diente speziell der Abklärung etwaiger familiärer Belastung mit Hirsutismus und psychiatrischen Erkrankungen, der Biographie, der Lebenssituation und des aktuellen Verhaltens, spezieller Einzelheiten einer evtl. psychopathologischen Symptomatik sowie der Übertragungsdynamik in der Untersuchungssituation. -Die Testbatterie bestand einerseits aus psychometrischen Verfahren, die objektive und quantifizierbare Daten liefern und einen Vergleich mit Standardwerten ermöglichen (daher konnten wir auf die in einem Klinikbetrieb technisch schwierige Zusammenstellung einer "normalen" Kontrollgruppe verzichten); es handelte sich dabei um folgende Tests: HAWIE = Hamburg-Wechsler-Intelligenztest für Erwachsene (vgl. WECHSLER, 1956); MMQ = Maudsley Medical Questionnaire (vgl. EYSENCK, 1953b); P-I-T = Persönlichkeits- und Interessentest (vgl. MITTENECKER und TOMAN, 1951) und P-F-T = Picture Frustration Test nach Rosenzweig (vgl. HÖRMANN und MOOG, 1957); andererseits wurden projektive Verfahren eingesetzt, die einen tieferen Einblick in die persönliche Problematik der einzelnen Pat. gewähren, nämlich der Rorschach-Test nach der Methode von KLOPFER (vgl. KLOPFER *et al.*, 1954) und der HTP = House-Tree-Person-Technique (vgl. BUCK, 1948). Auf diese Weise sollte eine Aussage ermöglicht werden über die wichtigsten Persönlichkeitsfaktoren: Intelligenz (HAWIE, Rorschach), emotionelle Labilität = "Neurotizismus" (vgl. EYSENCK, 1953a) (MMQ, P-I-T, Rorschach), Extraversion-Introversion (P-I-T, Rorschach), sowie über die soziale Einstellung (P-I-T, P-F-T) und das Selbstbild der Pat. (HTP, Rorschach). (Handschriften und eine Reihe weiterer Testbefunde—u.a. vom Wartegg'schen

TABELLE 1.—BIOLOGISCHE UND SOZIOLOGISCHE VARIABLE

(a) Durchschnittswerte	Klinikkollektiv $N = 42$	Stichprobe $N = 15$
Alter	28;6 J.	28;11 J.
Grösse	1,63 m*	1,64 m
Gewicht	63,27 kg*	63,19 kg
17-KS-Ausscheidg. im 24-Std.-Urin	13,16 mg*	13,14 mg

(b) Verteilungen		Klinikkollektiv $N = 42$	Stichprobe $N = 15$	Zahlen der Stichprobe, umgerechnet auf die Gesamtzahl des Klinikkollektivs ($N = 42$)
Altersklassen	15–19 J.	3	1	2,8
	20–24 J.	11	3	8,4
	25–29 J.	9	3	8,4
	30–34 J.	10	5	14,0
	35–39 J.	7 | 9	3 | 3	8,4 | 8,4
	darüber	2 /	0 /	0 /
Familienstand	ledig	23	9	25,2
	verheiratet	15	6	16,8
	verwitwet	1	(1 ×)	—
	geschieden	3	(1 ×)	—
Kinder	nein	33	12	33,6
	ja	9	3	8,4
Schulbildung	Abitur	6	2	5,6
	kein Abitur	36	13	36,4
Beruf	ohne	10	3	8,4
	mit	32	12	33,6
soz. Stand†	Unterschicht	13	5	14,0
	Mittelschicht	19	8	22,4
	Oberschicht	10	2	5,6

* Hierfür: $N = 39$.
† Nach eigenem Beruf oder Beruf des Ehemannes.

Zeichentest und vom Thematischen Apperzeptions-Test nach MURRAY—liegen vor, werden aber im Rahmen dieser Arbeit nicht berücksichtigt, da die Möglichkeiten ihrer objektiven und quantitativen Auswertung zu gering sind.)

Die Auswertung der einzelnen Testdaten und Explorationseindrücke geschah jeweils unabhängig voneinander, erst abschliessend wurden dann die Ergebnisse

miteinander verglichen. Unklarheiten und Widersprüche wurden, wenn möglich, durch Nachexplorationen geklärt. (Weitere Einzelheiten zur Methodik siehe MEYER und v. ZERSSEN, 1960.)

Nach Abschluss der Untersuchungsserie wurde zur Sicherung der Repräsentativität unserer Befunde anhand der Krankengeschichten ein Vergleich der anamnestischen Angaben unserer Pat. mit denen der übrigen Fälle des Gesamtkollektivs von 42 Fällen vorgenommen; ausserdem ein Vergleich der Angaben über den sozioökonomischen Status aller 42 Pat. mit den entsprechenden Daten aus der westdeutschen Gesamtbevölkerung* und unserer Poliklinikpopulation, worauf wir unten eingehender zu sprechen kommen.

D. BEFUNDE

1. *Explorationsergebnisse*

Im persönlichen Kontakt wirkten die Patientinnen, was ihr Verhalten betrifft, alle weiblich; z.T. waren sie sehr gepflegt und zeigten vereinzelt sogar ausgesprochenen Charme; nur H. M. wirkte etwas ungepflegt und liess sich einen Schnurrbart stehen (Wangen und Kinn wurden rasiert).

Zur Straffung der Darstellung und zur besseren Übersicht stellen wir die Querschnittsbefunde unserer 15 Fälle in Tabelle 2 zusammen.

Die "Persönlichkeitsstrukturen" beschreiben wir in den dynamischen Modellvorstellungen der psychoanalytischen Ich-Theorie; dabei differenzieren wir zwischen Angsthysterie und Angstneurose entsprechend den heutigen Auffassungen, also nicht im ursprünglichen Sinne FREUDS (vgl. v. KRIES, 1957).

Bei den vegetativen Symptomen haben wir psychosomatische Störungen wie Hypertonie, Migräne und Neurodermitis unberücksichtigt gelassen, weil deren diesbezügliche Zuordnung noch umstritten ist.

Bei der Beurteilung unterteilen wir nach der sozialen und beruflichen Bewährung ("B"), nach der Genussfähigkeit bzw. Zufriedenheit ("Z"); aber auch nach der persönlichen Entwicklung im Sinne der befriedigenden und sinnvollen Verwirklichung angelegter Möglichkeiten ("V"); als hierher gehörende Störungen betrachten wir beengende Charakterzüge, z.B. Autismus, und auch Funktionshemmungen, z.B. Frigidität, sofern sie nicht leidvoll erfahren werden (andernfalls kämen sie unter "Z").

Besprechen wir die klinischen Befunde, wie sie sich aus Tabelle 2 ergeben, so zeigt sich als Wichtigstes: alle 15 Patientinnen sind fassbar psychisch gestört (Kolonne rechts aussen). Dabei wird die Lebensbewährung ("B") kaum betroffen. Nur bei 2 Pat. bleibt die soziale Bewährung hinter ihren Möglichkeiten zurück: M. O. installiert sich als 'höhere Tochter' und lässt sich von ihren Eltern erhalten; E. K. bleibt in einer untergeordneten Stellung fixiert (s. Fallbeispiel). Betroffen wird hingegen die persönliche Reifung ("V") und die subjektive Zufriedenheit ("Z"). Die Art dieser Beeinträchigungen ergibt sich aus den anderen Kolonnen der Tabelle.

Dabei zeigt sich ein einheitliches Bild bei jenen Fällen, die ihren Hirsutismus intensiv ablehnen (E. K.; M. T.; U. G.; D. S. und auch C. S., die ihn schuldhaft erlebt): sie sind unglücklich (Z - -), zeigen eine deprimierte Grundstimmung oder sind mindestens ernst (M. T.; D. S.), ferner sind sie reaktiv verstimmbar in Richtung Trauer und Scham. Ausserdem finden sich Frigidität oder Coitusabwehr und Formen des Verhaltens, die wir als Exhibitionshemmung, Autismus und als "schizoide Entwicklung" bezeichnen, sowie verschiedene vegetative Störungen; wir werden diese

* Wir möchten auch an dieser Stelle dem Statistischen Bundesamt in Wiesbaden für die bereitwillige Unterstützung dieses Teils der Arbeit unseren Dank sagen.

TABELLE 2.—

Name Alter in Jahren	Persönlichkeitsstruktur	Verarbeitung des Hirsutismus	Grundstimmung	Verstimmbarkeit
E. W. 37	Angstneurotisch; masochistisch, weiblich-dienend	als nebensächlich akzeptiert	l. vitaldepressiv	reakt.: Angst, Trauer
M. B. 36	Zwangsneurose; orale Züge; viril identifiziert	als viriles Zeichen akzeptiert	forciert heiter u. lebhaft	reakt.: Angst (phobisch)
E. K. 36	Hyst. m. Zwangszügen u. schizoider Entwicklung; "androgyn"	int. Ablehnung; Exh.-hemm., Selbsthass	ernst bis hoffnungsarm	reakt.: Scham u. Angst
M. O. 34	Hyst. m. Konversion; Autismus; weiblich, aber unreif	als peripherer Makel abgelehnt	forciert heiter, dahinter aggressiv	keine
A. H. 34	(Armenierin) "androgyn"	ambivalent; agiert damit. l. Exh.-hemm.	synton	reakt.: Trauer
G. G. 33	Hyst. m. Agieren; weiblich-dienend	als nebensächlich akzeptiert (Exh.-hemm. wegen Gibbus)	forciert heiter u. lebhaft	reakt.: Scham u. Trauer
M. T. 32	Angsthyst. m. oralen u. Zwangszügen; weiblich, aber unmütterlich	int. abgelehnt; Exh.-hemm. (starke), Selbsthass	ernst, ängstlich	reakt.: Angst (phobisch), Trauer
C. S. 31	Zwangsstruktur m. schizoiden Zügen (Depersonalisation); viril identifiziert	als schuldbeladen verheimlicht; Exh.—hemm. Selbsthass	ernst, hoffnungsarm, unzufrieden	reakt.: Angst, Scham, Trauer
H. M. 28	Hyst.; oedipales Agieren; weitgehend viril identifiziert	als viriles Zeichen akzeptiert	wurstig	endog. (?): Dysphorie b. Migräne
B. R. 27	Hyst.; "androgyn"	als 'androgynes' Zeichen akzeptiert	forciert heiter	reakt.(?): Reizbarkeit, Trauer
B. G. 26	Angstneurot.; sadomasochistisch; oedipales Agieren; (Peniswunsch)	als Strafe empfunden u. als Makel abgelehnt: Exh.-hemm.	schw., mal lebhaft, mal wurstig	endog.(?): Reizbarkeit, Angst
U. G. 21	Narzisstisch; Autismus; (Kastrations-Komplex)	int. Ablehnung; Exh.-hemm.	traurig	reakt.: Trauer
M. H. 20	Hyst.; (Peniswunsch)	ambivalent; l. Exh.-hemm.	kindlich heiter	reakt.: l. Trauer
D. S. 20	Hyst.; weiblich identifiziert	int. Ablehnung; Exh.-hemm., schwerer Selbsthass	ernst, bedächtig	reakt.: Trauer u. Scham
H. S. 19	Narzisstisch; Agieren; bisex.	ambivalent; als ästhet. Makel abgelehnt; l. Exh.-hemm.	reakt. schw.: hochgestimmt-selbstanklagend	

Besondere Abkürzungen:

B = soziale u. berufliche Bewährung.
bisex. = bisexuell.
Def. = Defäkation.
Einschl. = Einschlafstörung.
Exh.-hemm. = Exhibitionshemmung.
frig. = frigide.
Hyst. = Hysterie.
int. = intensiv.
l. = leicht.
Obst. = Obstipation.
schw. = schwankend.
Sex. = Sexual (itär). (klein = sexuell).
V = Verwirklichung angelegter Möglichkeiten.
Z = Zufriedenheit (subjektives Wohlbefinden).

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QUERSCHNITTSBEFUNDE

Gesamtantriebshaftigkeit	"Einzeltriebe" (= vitale Bedürfnisse u. Funktionen) Sex.	Appetit	Def.	Schlaf	sonstieg vegetative Symptome	Beurteilung B	V	Z
—	++	+ bis +++	Obst.	++	×	++	−−	−
unverändert ++	reduziert	+++ Naschsucht	Obst.	++	ø	++	−	−
unverändert +	frig.	+	1. Obst.	++	×	−	−−	−−−
unverändert ++	(Virgo) Sex.-abwehr	+	++	++	ø	− −	− −	+
unverändert ++	++	++	1. Obst.	++	ø	+++	+	−
unverändert +	++	++	++	− (Einschl.)	×	++	+	−−
unverändert +	frig.	schw.	starke Obst.	+++ (9 Std.)	×	++	−	−−
unverändert ++	(Virgo) Sex.-abwehr	+	1. Obst.	++	×	+	−−	−−
unverändert +	frig.−−−	++	++	+++ (12 Std.)	ø	++	−−	−
unverändert ++	(Virgo) Sex.-Abwehr bisex. Impulse	schw.	++	−−−	×	++	−	+
zeitweise −	++	schw. − +++	1. Obst.	++	×	++	−	− −
angebl. unverändert + − (wirkt aber verlangsamt)	(Virgo) latent homosex.	+	++	++	ø	++	−?	−−
unverändert ++	frig. Sex.-Abwehr	++	1. Obst.	+	×	++	−	−
unverändert ++	frig. Sex.-Abwehr	schw. + bis +++	1. Obst.	− (Einschl.)	ø	++	−?	−−
unverändert ++	(Virgo) Sex.-Abwehr; bisex. Impulse	++	++	− (Einschl.)	ø	+	−	−−

Zeichen:

\+ = mässig.
++ = gut.
+++ = sehr gut.
− = leicht beeinträchtigt.
−− = mittelgradig beeinträchtigt.
−−− = stark beeinträchtigt.
× = vorhanden.
ø = nicht vorhanden.

Symptome unter dem Titel Akzeptationsproblematik in der Besprechung auf ihren inneren Zusammenhang prüfen.

Unter Exhibitionshemmung verstehen wir, dass die Pat. die Gewohneit annehmen, mit den Händen die untere Gesichtshälfte abzudecken, (oder sich möglichst im Halbdunkel aufzuhalten (U. G.)), in eine hastige Bewegungsunruhe des ganzen Oberkörpers zu verfallen, damit man sie nicht genauer betrachten könne (D. S.), hochgeschlossene Blusen (wenn möglich mit hohem, halsnahem Kragen) und lange Röcke zu tragen (C. S.; M. H.; D. S.) und dass sie körperliche Kontakte vermeiden wie Umarmen, Streicheln oder Küssen (U. G.; D. S.), sogar mit dem eigenen Mann und auch, wenn sie sich danach sehnen (M. T.).

Generalisiert sich die Exhibitionshemmung, so werden die sozialen Beziehungen eingeschränkt; man vermeidet neue Bekanntschaften, man verringert den Kontakt mit den alten; man geht nicht mehr zum Gruppensport, zu Gesellschaften, zum Tanzen, kurz: man wird 'menschenscheu' (s. Fallbeispiel).

Für den nicht psychoanalytisch orientierten Leser müssen wir betonen, dass unter Exhibieren bzw. Exhibition das normale "sich zeigen", "aus der Menge hervortreten", "auf sich aufmerksam machen" verstanden wird, wovon der Exhibitionismus bzw. das Exhibitionieren zu trennen ist, nämlich das perverse Zeigen der Genitalien.

Werden die Umweltkontakte auch emotionell entleert und stattdessen ins Wunschdenken geflüchtet oder Tagträume gesponnen (M. O.; U. G.), so entsteht das Bild des Autismus. Wird die Emotionalität überhaupt abgesperrt, so kommt es zu einer Persönlichkeitsentwicklung, die sich dem Schizoiden nähert bzw. mit ihm verwechselt werden könnte (E. K.; C. S.).

Es finden sich auch Beachtungsgefühle: die Pat. glauben, sie würden besonders beachtet oder sogar höhnisch oder spöttisch gemustert (E. K.; A. H.; G. G.; C. S.; B. R.; U. G.; M. H.; D. S); die Kritik bleibt dabei aber erhalten, und nur bei C. S. gehen die Beachtungsgefühle ins Paranoide.

Ferner finden sich Züge der Ablehnung des hirsuten Körpers, ja der ganzen Person: M. T. beneidet jede Frau um ihre "schiere Haut"; D. S. kann sich nicht mehr in einem Spiegel sehen; E. K., M. T., C. S. und D. S. hassen sich selber.

Aspektmässig zur selben Gruppe gehört G. G., deren Akzeptationsproblematik aber ganz um den vorbestehenden (in bekleidetem Zustand nicht sichtbaren!) Gibbus zentriert ist, während der Hirsutismus davon frei bleibt bzw. als ganz nebensächlich akzeptiert wird. (Nach den Erfahrungen dieser Pat. lehnen die Männer ihren Hirsutismus micht ab, sondern finden sogar Gefallen daran!)

Von den restlichen 9 Pat. zeigen M. O., A. H. und M. H. mur ein Teilbild dieses Syndroms, das wir als Akzeptationskomplex diskutieren werden, die leiden subjektiv weniger und sind auch (abgesehen von M. O., die wir oben bei "V" erwähnten) in der Verwirklichung ihrer Lebensmöglichkeiten nicht wesentlich beeinträchtigt.

Die Hauptstörungen der restlichen Pat. sind anders gelagert und unter sich recht verschieden; hingegen ist diesen Pat. gemeinsam, dass sie ihren Hirsutismus weitgehend akzeptiert haben, als nebensächlich (E. W.) oder als Strafe (B. G.) oder als Ausdruck ihres Wesens (M. B.; H. M.; B. R.; H. S.; allerdings ist er für die narzisstische H. S. ein ästhetischer Makel). E. W. und B. G. zeigen angstneurotische Anfälle; die andern sind deutlich androgyn (B. R.; H. S.) oder sogar weitgehend viril identifiziert (M. B.; H. M.) und sind dadurch in der Verwirklichung ihrer Lebensmöglichkeiten beschränkt; M. B. weniger dadurch als durch eine Zwangsneurose, unter der sie subjektiv leidet. B. R. leidet subjektiv wenig, H. S. hauptsächlich unter ihrem narzisstisch-pubertären Rollenwechsel und unter ihrer (überwiegend homosexuellen) Bisexualität.

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In der Kolonne "Persönlichkeitsstruktur" finden sich zwar in der Mehrzahl hysterische Strukturen, doch zeigen diese untereinander erhebliche Unterschiede; die Einteilung in hysterische, zwangshafte etc. Strukturen ist ja nur eine erste Annäherung, innerhalb welcher ein weiter Spielraum offen bleibt. Eine Gemeinsamkeit in Form androgyner oder sogar überwiegend viriler Identifikation, bei im übrigen ganz verschiedenen Strukturen, findet sich bei eben erwähnten 4 Pat.: M. B.; H. M.; B. R.; H. S.

Damit verwandte Züge finden wir aber auch bei 7 anderen Pat., nämlich einen intensiven Peniswunsch bei C. S., Abkömmlinge eines intensiven Kastrationskomplexes mit gewissen Peniswünschen bei A. H. und E. K., Abkömmlinge nur des Kastrationskomplexes bei U. G., Abkömmlinge eines gewissen Peniswunsches bei M. H. und B. G., lediglich eine starke Ablehnung der weiblichen Rolle ohne sicher fassbaren Peniswunsch bei M. T.

Das Selbstbild dieser 7 Pat. ist bei C. S. und E. K. ganz bewusst, bei A. H. fast bewusst, bei B. G. unbewusst androgyn; M. H. sieht sich (spielerisch) als zukünftiger Mann, die anderen (U. G. und M. T.) sehen sich weiblich (M. T. dabei als unmütterlich).

Der grundlegende Unterschied zu den oben erwähnten 4 Fällen mit bewusst akzeptierter viriler Identifikation ist, dass diese 7 Pat. ihre Peniswünsche bzw. entsprechenden Selbstbilder nicht akzeptieren, sondern—mit allerdings verschiedener Stärke—ablehnen.

In diesem Zusammenhang muss betont werden, dass homosexuelle Züge in unserer Stichprobe die Ausnahme sind; gelebte Homosexualität findet sich nur einmal (H. S.), bewusstwerdende homosexuelle Impulse noch einmal (B. R.), latente bei U. G. und sehr fragliche bei M. H.

Nach unserem klinischen Eindruck ist die Androgynieproblematik in unserer Gruppe mit gewöhnlichem Hirsutismus wohl nicht häufiger, sicher aber deutlicher und stärker als bei den weiblichen Neurotikern, die wir in unserer Ambulanz zu sehen pflegen. Dies lässt sich so belegen: hier kommen schon in der Exploration Haltungen, Wertungen, Wünsche und Phobien zutage, die sonst erst nach vielen Analysestunden fassbar werden (je nach Verlauf erst in der 50, 100 oder 200 Stunde).

Während wir in der Struktur dieser Androgynieprobleme keine Unterschiede erfassen können zwischen unserer Hirsutismusgruppe und nicht-hirsuten weiblichen Neurotikern, so finden wir hingegen bei einzelnen Pat. etwas, was wir nur beim Hirsutismus sahen: eine tiefgehende Unsicherheit in bezug auf die eigene Geschlechtsidentität.

E. K. bestellt nach Ausbruch ihres Hirsutismus ihre Mutter als Schiedsrichter, ob sie ein Mann oder eine Frau sei (s. Fallbeispiel); H. S. identifiziert sich einmal mit Männern, dann wieder mit Frauen; A. H. zeigt ein eigenartiges Agieren: sie glaubt, ein Mann zu werden, weil sie (eine akademisch gebildete und anatomisch interessierte Frau!) ihre Clitoris für einen sich noch entwickelnden Penis hält, sie läuft von Arzt zu Arzt, um sich bestätigen zu lassen, dass sie eine "normale Frau" sei; da sei nie etwas von ihrer Clitorisinterpretation erwähnt, behält sie ihren Glauben, doch ein Mann zu werden, denn der Arzt könnte die Clitoris ja übersehen haben.

Die "Gesamtantriebshaftigkeit" ist bei E. W. vermindert und auch bei B. G.; bei U. G. ist sie nach eigenen und nach Angaben des Vaters trotz einer gewissen Verlangsamung in der Untersuchung im häuslichen und beruflichen Bereich offenbar nicht beeinträchtigt.

Von den "Einzeltrieben" ist die Sexualität häufig gestört; orgasmusfähig sind nur

die beiden angstneurotischen Pat., ferner A. H. und (angeblich) G. G. Bei den virginellen Pat. besteht eine starke Abwehr des Coitus, sie erleben aber z.T. masturbatorische oder Spontan-Orgasmen (B. R. und D. S. gaben hierüber keine Auskunft). Die vereinzelten homosexuellen Züge haben wir erwähnt.

In unserer Gruppe finden sich 5 adipöse Pat. und 3 mit beginnender Adipositas, die auch einen reichlichen Appetit, in einem Fall sogar ausgesprochene Naschsucht angaben. Stark schwankend ist der Appetit bei E. W.; reaktive Appetitschwankungen stärkeren Grades (z.B. auf Ärger) gaben B. G. und D. S. an, leichtere M. T. und B. R. Beim Schlaf zeigen sich dreimal Einschlafstörungen, zweimal eine starke Schlafneigung; bei der Defäkation sechsmal leichte Obstipation bzw. Neigung dazu, und dreimal schwerere Grade. Ausgelassen wurden in der Tabelle Miktion und Durst sowie die Temperaturempfindlichkeit; die Miktion ist bei allen Pat. unauffällig; Durstphasen bestanden nur vorübergehend bei E. W. (während einer Abmagerungskur), bei den anderen war der Durst konstant. Die Empfindlichkeit auf Wärme bzw. Kälte weist in keinem Falle einen besonderen Stärkegrad auf.

An sonstigen vegetativen Symptomen sind Schwitzen, Heizklopfen, Erröten, Schwindel, Zittern und Kopfschmerzen hervorzuheben.

Intellektuell bieten die Pat.—beurteilt nach ihrem Bildungsgang und dem im Gespräch gezeigten Niveau—zwar deutliche individuelle Unterschiede, ohne dass diese aber einen auffälligen Grad oder eine bestimmte Richtung erkennen lassen.

Auf die familiäre Belastung mit Hirsutismus und schweren psychischen Störungen und auch auf die recht eindrücklichen Angaben über die Lebenssituationen z.Zt. des Auftretens des Hirsutitmus, die in Tabelle 3 aufgeführt sind, gehen wir in der Besprechung ein.

2. *Testergebnisse*

Da sich die Ergebnisse der Testuntersuchungen mit denen der klinischen Erhebungen weitgehend decken, sollen sie hier nur soweit dargestellt werden, wie es zur Sicherung und Abrundung des Gesamtbildes notwendig ist. Deshalb verzichten wir darauf, die an den einzelnen Pat. erhobenen Befunde gesondert aufzuführen, und gehen statt dessen ausschliesslich auf die querschnittmässige Auswertung aller Testprotokolle ein (siehe v. ZERSSEN, a.a.O.). Die Reihenfolge der Darstellung richtet sich nach den im Abschnitt Methodik formulierten speziellen Fragestellungen der Testuntersuchung.

Die Intelligenz der Versuchsgruppe liegt mit einem Durchschnitts-IQ von 96,07 bei einer Standardabweichung von S = 14,21 etwas, aber nicht signifikant unter dem Durchschnittswert der Gesamtpopulation (IQ = 100, σ = 15). Aus den Rorschach-Protokollen (siehe Tafel I) ist zu ersehen, dass von der Mehrzahl der Pat. ihre intellektuelle Kapazität (gemessen am Durchschnittswert des höchsten Formniveaus der Einzelprotokolle = + 2,4) nicht voll ausgenutzt wird (verminderte Produktivität, gemessen an der geringen durchschnittlichen Antwortenzahl = 19,5; häufige Beeinträchtigung der Formerfassung, gemessen an dem Auftreten von F-Minus-Antworten bei Zwei-Drittel der Pat. u.a.). Die Ursache dafür liegt in einer emotionellen Störung (Verlängerung der durchschnittlichen Reaktionszeit zu den einzelnen Tafeln auf 28,6 sek. und der Zeit pro Antwort auf über 1 Min), die sich speziell in zwei Bereichen äussert: 1 dem der Geschlechtsrolle und 2 dem des mitmenschlichen Kontakts. Dies ist in den Einzelprotokollen zwar aus jeweils verschiedenen formalen wie inhaltlichen Aspekten ersichtlich, zeigt sich aber auch an einigen für die Gesamtheit charakteristischen Durchschnittswerten: Die relativ stärkste Verzögerung der durchschnittlichen Reaktionszeit zu den einzelnen Tafeln auf fast (Tafel VII) oder über (Tafel III

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Tabelle 3.—Familienanamnese und Lebenssituation bei Auftreten des Hirsutismus (H.)

Name Alter in Jahren	An nam. erfasste Familienmitglieder			Alter in Jahren und Lebenssituation beim ersten Auftreten des H. (bzw. bei deutlicher Verstärkung eines vorher geringen H.)
	Zahl	H.-Fälle	Psychosen	
E. W. 37	9	—	—	*c.* 30–34. Chronischer Konflikt: Pat. an greisen Vater u. an Ehemann infantilmasochistisch fixiert; Vater explosiv (Pflegefall); Gatte verlangt, Vater ins Heim zu geben. Mit 37 I schwere Hepatitis und Verstarkung des H.
M. B. 36	17	2 (Urgrossmutter u. Grosstante)	1 (Mutters-Bruder; ferner 1 Zwangsneurose bei H.)	*c.* 18–20. Seit 10–12. Lj. chronischer Konflikt mit Mutter; seit 16.Lj. Zwangsneurose.
E. K. 36	7	—	—	*c.* 25. *Schwer schuldbeladener oedipaler Konflikt:* beginnt Verhältnis mit ihrem Hausherrn, das in dauernder Hausgemeinschaft mit dessen Frau 2 J. anhält. (Siehe Fall-Beispiel.)
M. O. 34	4	1 (Mutter, ganz leicht)	—	*c.* 16. Wegen Abwehr (Verleugnung u. Verdrängung) nichts zu erfahren; Konflikt möglich.
A. H. 34	5	1 (Mutter, leicht)	—	*c.* 23–26. Anscheinend kein aktueller Konflikt.
G. G. 33	7	—	—	*c.* 16. Akzeptationskonflikt mit Mutter: Pat. in Lehre, beginnt harmlos auszugehen, Mutter lehnt das als Zeichen von Frühreife u. Sünde ab; vergleicht Pat. mit dem geschiedenen Vater.
M. T. 32	9	2 (Mutter u. Vaters-Schwester)	1 (Grosscousine)	20. *Aktueller Konflikt:* lehnt ihren Verlobten und sex. Beziehungen, zu ihm intensiv ab; Mutter treibt Pat. aktiv in diese Bindung; Pat. deshalb über Mutter sehr verzweifelt.
C. S. 31	6	—	—	20. *Akuter intensiver Konflikt:* mit 19½ beginnt Pat. magische Übungen um bewusst ein Mann zu werden; etwas später wird sie von der Familie in eine Beziehung zu einem Mann gedrängt.

Tabelle 3. (*Continued*)

H. M. 28	15	—	(1 Suicid: Mutters-Schwester)	16. Aktueller, leichter Konflikt: beginnt Kindergärtnerinnenlehre und muss realisieren, dass sie mit Kindern wegen innerer Widerstände in keiner Weise zurechtkommt.
B. R. 27	6	1? (Schwester: 'Koteletten')	—	16. Wegen Abwehr (Verdrängung u. Verleugnung) nichts zu erfahren; Konflikt möglich.
B. G. 26	7	1 (Grosstante)	—	24. *Schwerer Konflikt seit 1 J.:* sadomasochistische Liebesbeziehung zu Vaterfigur mit intensiven Auseinandersetzungen.
U. G. 21	19	—	—	19½. Fraglicher Konflikt: Freund wird psychotisch; Bevölkerung verschreit (rothaarige) Pat. als Hexe; um diese Zeit Mensesstörungen; akuter Hirsutismus aber erst ¼ J. später nach Hirnoperation (wegen Aneurysmablutung).
M. H. 20	9	—	—	14½. Konflikt: Verschärfung der Benachteiligungsgefühle gegenüber den Brüdern; Pat. wird auswärts in eine Lehre gegeben, wo sie sich ausgenutzt vorkommt.
D. S. 20	12	—	—	14. Chronischer Konflikt: Ablehnung des Vaters; Rivalität gegenüber dem bevorzugten Bruder um die Gunst der Mutter.
H. S. 19	3	1 (Mutter)	1? (Mutter)	15. Chronische Pubertätskonflikte: Ablehnung der Mutter, Suche nach einer besseren; Homosexualität; Schwanken zwischen Weltbejahung und -verneinung.

u. IX) das Doppelte der von PHILLIPS und SMITH (1953) angegebenen Normwerte (Tafel III: 12,8 sek. Tafel VII: 14,2 sek, Tafel IX: 26,4 sek.) findet sich einerseits bei den beiden Tafeln, die—auch in unserer Gruppe—am häufigsten sexuell differenzierte menschliche Bewegungsdeutungen (M) evozieren (Tafel III: männliche, Tafel VII: weibliche), andereseits derjenigen Farbtafel, die durch das Fehlen klarer Formgebung (Tafel IX) stärker als die übrigen Farbtafeln zu einer Auseinandersetzung mit der Farbe als dem Repräsentanten der umweltbezogenen Emotionalität zwingt.

Diese Interpretationen werden noch gestützt durch eine Analyse der Inhalte der M-Deutungen: Eine Beeinträchtigung des unmittelbaren und reifen Kontaktes

wird angezeigt durch den relativ geringen Anteil ganz gesehener realer Mensch-Figuren (H = 20 von insgesamt 46 hauptsächlichen und zusätzlichen M-Deutungen), eine Störung der sexuellen Identifikation durch den relativ geringen Anteil sexuell differenzierter, d.h. männlicher oder weiblicher, Figuren oder Körperteile (von den 46 M-Deutungen wurde bei 20 auch im Inquiry eine Geschlechtsbestimmung vermieden gegenüber 16 männlichen und 10 weiblichen Inhalten): darin liegt offenbar ein Ausweichen vor der Konfrontierung mit der Geschlechtsrolle, ähnlich, wie sie von BERGMAN (1945) in den Protokollen männlicher Homosexueller gefunden wurde.

Um auszuschliessen, dass es sich bei der Verteilung der Inhalte der M-Deutungen um den unspezifischen Ausdruck irgendwelcher emotioneller Syndrome handelt, wurden 15 Protokolle einer nach dem Alter (*18 bis 39 Jahre*) ausgelesenen psychiatrischen Patientinnengruppe mit verschiedenen emotionellen Störungen (*überwiegend depressive Verstimmungszustände und einzelne soziale Verhaltungsstörungen*) zum Vergleich herangezogen.* Hier fand sich unter insgesamt 23 hauptsächlichen und zusätzlichen M-Deutungen ein Anteil von 16 H und eine Relation von 3 geschlechtlich indifferenten gegenüber 14 männlichen und 6 weiblichen Inhalten, auf 46 Antworten umgerechnet also 32 H gegenüber 20 in unserer Gruppe und eine Relation sexuell indifferent: (männlich + weiblich) wie 6 : (28 + 12) gegenüber einer Relation von 20 : (16 + 10). Der Unterschied liegt in der erwarteten Richtung, ist allerdings wegen der zu geringen Zahl von M-Deutungen in der psychiatrischen Vergleichsgruppe statistisch nicht zu sichern.

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Das Vorliegen einer spezifischen Störung des mitmenschlichen Kontakts in unserer Gruppe wird noch belegt durch das Überwiegen formunscharfer (CF + C) über formscharfe Farbantworten (FC), besonders aber durch das Überwiegen der 'texture' (Fc + c = 2,7) und der achromatischen 'Farb'-Antworten (C′ = 0,8) gegenüber den chromatischen (FC + CF + C = 2,2), das sich der Relation 2 : 1 annähert, deren Interpretation nach KLOPFER lautet, dass 'the person's responsiveness to outside stimulation has been interfered with by some kind of traumatic experience and withdrawal has resulted. This is the 'burnt child' hypothesis. The implication is that need for an affectional response from others is so great that the person is inhibited and toned-down in his overt reactions to others for fear of being hurt or repulsed. There is a resulting overcautiousness in emotional contacts.' (KLOPFER *et al.*, 1954, S.292 f.).

Damit ist die Frage der Extraversion–Introversion angeschnitten: Nach der Relation (Fc + c + C′) : (FC + CF + C) zu urteilen, ist eine Einschränkung der Extratensivität für die Gruppe charakteristisch, während das nur geringe Überwiegen von M über sum C (2,3 : 1,8) anzeigt, dass dies nicht durchweg zu einer Verstärkung introversiver Tendenzen geführt hat. In dem Bild, das so entsteht, sind depressive Züge unverkennbar, wofür sich an einzelnen Belegen besonders die relativ geringe Antwortenzahl, die relativ lange Reaktionszeit pro Tafel und Zeit pro Antwort, der etwas eingeengte Erlebnistyp mit der Verschiebung der Farbskala auf den unbunten Sektor der "texture"- and C′-Antworten anführen lässt. In diesem Zusammenhang könnte man auch den geringen prozentualen Anteil der H- an den M-Deutungen als Mangel an natürlicher Selbstbejahung (self-acceptance) interpretieren.

Die übrigen Tests bestätigen diese auf Grund des Rorschach-Tests aufgestellten Hypothesen betreffs der Häufigkeit emotioneller Störungen und ihrer spezifischen

* Wir danken Herrn Oberarzt Dozent Dr. ALBRECHT und Fräulein Dipl.-Psych. GUTZEIT von der Psychiatrischen und Nervenklinik des Universitäts-Krankenhauses Hamburg-Eppendorf (Direktor: Prof. Dr. BÜRGER-PRINZ) für die freundliche Überlassung der Protokolle.

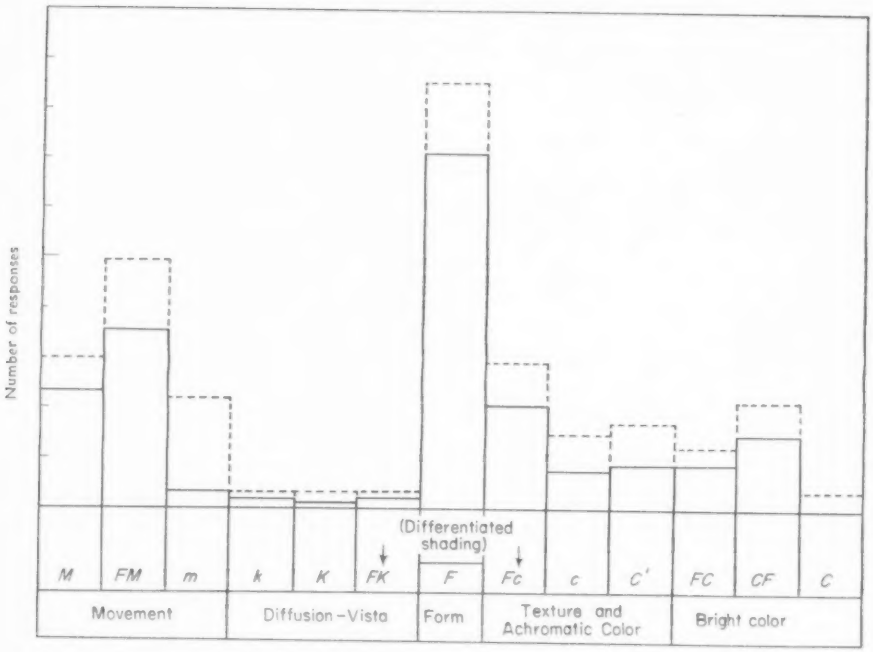

Abb. 1.—DURCHSCHNITTSWERTE DER RORSCHACH—PROTOKOLLE (N = 15). (DARSTELLUNG IN ANLEHNUNG AN KLOPFER *et al.* (1954).

RELATIONSHIPS AMONG FACTORS

Total responses (R) = 19,5

Total time (T) = 20,9 min

Average time per response (T/R) = 64,3 sec

Average reaction time* for Cards I = 9,0 sec
IV = 25,9 sec
V = 17,7 sec
VI = 36,2 sec
VII = 27,7 sec

Σ = 116,5 sec
$\overline{X}$ = 23,3 sec

Average reaction time* for Cards II = 33,3 sec
III = 29,2 sec
VIII = 16,5 sec
IX = 66,0 sec
X = 24,0 sec

Σ = 169,0 sec
$\overline{X}$ = 33,8 sec

$$\frac{\text{Total F}}{R} = 35{,}4\ \text{F}\%$$

$$\frac{FK + F + Fc}{R} = 43{,}4\%$$

$$\frac{A + Ad}{R} = 54{,}8\ \text{A}\%$$

Number of P = 4,8
Number of 0 = 2,4
(H + A) : (Hd + Ad) = 11,2 : 1,4

$$\Sigma\,C = \frac{FC + 2\,CF + 3\,C}{2} = 1{,}8$$

M : Σ C = 2,3 : 1,8

(FM + m) : (Fc + c + C') = 3,8 : 3,5

$$\frac{\text{(No. of responses to Cards VIII, IX, X)}}{R} = 36{,}0\%$$

W : M = 8,3 : 2,3

W(42,32%), D(45,05%), d(3,41%), Dd and/or S(9,22%)

Form-level: Highest = +2,4; Average = +1,1; Weighted = +1,3; Lowest = −0,4

* Für *N* = 13: ohne M. B. (Deutsch-Polin) u. A. H. (Perserin), u. z. wegen Sprachschwierigkeiten.

Gestaltung. So liegt die Gruppe in den Durchschnittswerten der neurotischen Tendenz im MMQ ($X = 23{,}00$ bei einem s von 7,23) wie im P–I–T (D−: $X = 9{,}00$ bei einem s von 3,92) statistisch sehr signifikant* über den Normwerten (MMQ: $X = 10{,}98$, $s = 7{,}03$; P–I–T, Kategorie D−: $X = 5{,}83$, $s = 2{,}75$). Entsprechendes gilt für die Häufigkeitsverteilung der Einzelfälle auf die Quartile der Kategorie D− des P–I–T, während das umgekehrte Verhältnis in der Kategorie D+ (= "nicht neurotisch") besteht.

Von den übrigen Befunden im P–I–T ist die Ausprägung depressiver Züge sehr signifikant (F− über, F+ unter der Norm), eine herabgesetzte vegetative Stabilität (I+ unter der Norm) und ebenso eine Verminderung der Extraversion (C+ unter der Norm) signifikant* (auch diese Angaben beziehen sich sowohl auf die Durchschnittswerte wie auf die Häufigkeitsverteilung der Einzelfälle). In den übrigen Testkategorien heben sich die individuellen Abweichungen, soweit vorhanden, gegenseitig weitgehend auf, auch in der "sozialen Einstellung" (Rubrik B) ist dadurch keine einheitliche Tendenz nachweisbar.

Das so gewonnene Bild wird noch bereichert durch die Zusammenstellung der von der überwiegenden Mehrzahl der Pat. gleichsinnig beantworteten Feststellungen der beiden Questionnaires, denen ein gewisser Symptomwert wohl kaum abgesprochen werden kann (auf die Problematik dieses Vorgehens, das im Sinne der Item-Analyse nicht ganz korrekt ist, wird an anderer Stelle eingegangen, vgl. v. ZERSSEN, a.a.O.). Ordnet man die so gewonnenen Einzel-"Symptome" zwanglos nach ihrem psychologischen Zusammenhang (also nicht nach ihrem Stellenwert im Rahmen der einzelnen Testkategorien), so werden neben unspezifischen nervösen Beschwerden und depressiven Zügen einzelne autistische Züge (z.B. "Auf gesellschaftlichen Veranstaltungen halte ich mich gewöhnlich zurück", "Ich grüble viel"), Zeichen von Ängstlichkeit ("Ich bekomme leicht Lampenfieber", "Ich habe fast immer Angst vor etwas oder vor jemandem") und von Aggressionshemmung ("Wenn ich mit jemandem in Streit gerate, beherrsche ich mich") erkennbar. Dass diesen Zeichen tatsächlich ein gewisser Symptomwert zukommt, wird durch die klinischen Befunde belegt. Die Aggressionshemmung kommt ausserdem noch zum Ausdruck im P–F–T, wo sich im "Group-Conformity-Rating" eine statistisch sehr signifikante Abweichung in Richtung auf "non-conformity" findet (stärkere Besetzung des 1. Quartils, Durchschnittswert $< Q_1$), die bedingt ist durch eine ebenfalls sehr signifikante Verminderung der nach aussen gerichteten (extrapunitiven) Aggressivität (Kategorie E) zugunsten einer impunitiven Haltung, d.h. einer Umgehung der Aggression (Kategorie M). Auf Grund gewisser formaler (häufiger Rotschock bei Tafel II) wie inhaltlicher Aspekte der Rorschach-Protokolle (Häufigkeit bedrohlicher und eigentlich aggressiver Themen: vgl. dazu SCHAFER, 1954) ist anzunehmen, dass es sich bei der Aggressionsverminderung tatsächlich um den Ausdruck einer Aggressionshemmung handelt und nicht den einer primär schwach angelegten oder im Zuge des "Sozialisierungsprozesses" der Es-Impulse erfolgreich sublimierten Aggressivität.

Zu einem ähnlichen Resultat führt die querschnittsmässige Auswertung der Person-Zeichnungen im H T P: Das Fehlen der Hände in 8 von 15 Zeichnungen ist ein auffallend häufiger Befund; gegenüber einem von uns aus einer Gruppe von

* Sehr signifikant bedeutet hier und im folgenden unter dem 1%-Niveau der Wahrscheinlichkeit ($p < 0{,}01$), signifikant unter dem 5%-Niveau ($p < 0{,}05$). Weitere Angaben zu den in dieser Arbeit durchgeführten statistischen Berechnungen siehe v. ZERSSEN, a.a.O.

142 'normalen' Frauen im Alter zwischen 19 und 30* Jahren errechneten "Normwert" von $p = 0{,}2$ (das wäre 3 auf 15) ergibt er eine sehr signifikante Abweichung. Von der zeichnerischen Begabung der Pat. ist das Fehlen der Hände offensichtlich nicht abhängig; lediglich konnten wir in Übereinstimmung mit WOODS und COOK (1954) feststellen, dass bei guter Zeichenbegabung die Hände häufiger (hinter dem Rücken oder in den Taschen) versteckt, bei schlechter dagegen einfach fortgelassen werden. Die psychologische Interpretation dieses Befundes als Zeichen einer Aggressionshemmung liegt in der symbolischen Bedeutung der Hand als "means with which to take defensive or offensive action against the environment or the self" (BUCK, 1948, S. 51). Neben dem von BUCK herausgestellten aggressiven Charakter der Hand ist aber wohl auch ihr libidinöser Aspket als einem "Kontaktorgan" schlechthin zu berücksichtigen. In diesem umfassenderen Sinn bezeichnet MACHOVER die Gliedmassen auch als die "anatomischen Elemente des äusseren Kontaktes" (zitiert nach GAYRAL und STERN in: STERN, 1955). Die allgemeine Interpretation würde also Kontaktscheu in des Wortes weitester Bedeutung lauten.

Von besonderem Interesse ist natürlich die Behandlung der Geschlechtscharakteristika der gezeichneten Personen, die ja in der Theorie der projektiven Verfahren als eine Art "inneres Selbstbildnis" aufgefasst werden. Bemerkenswerterweise wurde nur dreimal ein männliches Wesen gezeichnet (M. B.: "Pensionär"; C. S.: 14- bis 16-jähriger "Knabe" und B. G.: "Kasper"). Dies ist—allerdings nicht signifikant—seltener als nach dem von uns aus der oben erwähnten Eichgruppe errechneten "Normwert" ($p = 0{,}3$; d.h. 5 × von 15) zu erwarten wäre. Dagegen wurde im "Post-Drawing-Interview" auf die Frage nach dem Geschlecht nur von der Hälfte der Pat. die einfache Angabe "eine Frau" oder "ein Mann" bzw. "ein Junge" gemacht, während in den übrigen Fällen, auch da, wo im Betrachter kein Zweifel aufkommen konnte, umständlichere Formulierungen gebraucht wurden oder gar der Versuch gemacht wurde, der Frage überhaupt auszuweichen, was nach BUCK (1948, S. 69) sehr auffällig ist. (Zum Beispiel B. R.: "Das sollte eine Frau *sein*"; H. S.: "Einfach ein Mensch etwas schemenhaft", erneute Frage des Versuchsleiters: Männlich oder weiblich? "Nein, das bleibt offen.—Ist schon eine Frau." E. K.: s. Fallbeispiel.) Diese eigentümliche Reaktion auf die Frage nach dem Geschlecht bestätigt die aus den Rorschach-Protokollen abgeleitete Hypothese, dass die Pat. vor einer Konfrontierung mit der Geschlechtsrolle zurückscheuen. Darin drückt sich eine Unsicherheit der sexuellen Identifikation aus: man will sich "nicht festlegen"; eine eigentliche virile Identifikation scheint dagegen nicht die Regel zu sein.

3. *Psycho- und soziologische Gruppenvergleiche*

Aus einer Gegenüberstellung der in den Krankengeschichten vor Beginn unserer Untersuchung fixierten Angaben über psychische Störungen (funktionelle Beschwerden und Verstimmungen) mit entsprechenden Angaben aus den Krankengeschichten der übrigen Pat. des Gesamtkollektivs der 42 Klinikpat. ergibt sich, dass unsere Gruppe sich offenbar in dieser Hinsicht nicht von den übrigen Fällen abhebt. Einerseits fehlen bei einigen unserer Fälle Angaben dieser Art ganz, andererseits finden sie sich in der Mehrzahl der übrigen Fälle. Die auf Grund der biosoziologischen Daten

* Wir danken Herrn Dipl. Pysch. COHEN vom Psychologischen Institut der Universität Hamburg (Direktor: Prof. Dr. P. P. HOFSTÄTTER), der uns freundlicherweise sein Testmaterial für die Errechnung der "Normen" zur Verfügung stellte.

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eingangs getroffene Feststellung, dass es sich bei unserer Versuchsgruppe um eine repräsentative Stichprobe handelt, wird dadurch noch erhärtet.

Dagegen lässt sich ein bedeutsamer Unterschied des Gesamtkollektivs der 42 Fälle gegenüber der Durchschnittspopulation aufdecken: In der Rubrik "Familienstand" liegt der prozentuale Anteil der Ledigen und Geschiedenen (d.h. der Fälle mit nicht geglückter stabiler sexueller Partnerbeziehung) sehr signifikant über den entsprechenden Werten, die durch die Volkszählungen von 1950 und 1957 für Frauen der entsprechenden Altersklassen aus der westdeutschen Gesamtbevölkerung ermittelt wurden. Um auszuschliessen, dass sich dieser Unterschied aus der Selektion einer Klinikpopulation ergibt, wurde aus unserer Poliklinik-Kartei zu jeder der 42 Pat. unseres Kollektivs eine gleichaltrige aus demselben Untersuchungsjahr nach dem Zufall ausgesucht. Die Relation (verheiratet und verwitet) : (ledig und geschieden) weicht nicht wesentlich von der aus den Volkszählungen bekannten Verteilung ab, während der Unterschied gegenüber unserer Versuchsgruppe auch hier—unter der hypothetischen Annahme eines gemeinsamen Populationsparameters—unter dem 1%-Niveau der Wahrscheinlichkeit liegt (siehe v. ZERSSEN, a.a.O.).

4. *Fall-Beispiel*

E. K., 36-jährig. (In der Familie kein Hirsutismus, keine psychiatrischen Erkrankungen.) Als zweites von sechs Kindern eines verbitterten, tyrannischen Vaters aufgewachsen, der seine Familie für seine eigenen Lebensenttäuschungen büssen liess und die Kinder zu blindem Gehorsam erzog. Die Mutter, gläubig und extrem selbstlos, litt duldend; sie wurde Jahr für Jahr schwanger; meist kam es zu Fehlgeburten.

Bei E. K. normale Schwangerschaft und Geburt. 10 Monate gestillt. Im 3. bis 5. Lj. panische Angst, sie werde geschlachtet, entsprechende Träume; panische Angst vor jedem Mann. Als Kleinkind sehr sauber (machte sich nie schmutzig und verschenkte Spielsachen, die andere angefasst hatten), sammelte leere Schachteln. Liebte Tiere, konnte sie aber nicht berühren, sonst Übelkeit.

In der Schule sehr gefügig und gewissenhaft, verriet sich regelmässig, wenn sie etwas Unrechtes getan hatte. Entwickelte starke Religiosität, hatte grosse Angst, Sünden zu begehen, brachte Opfer und versetzte sich in die Leiden Christi.

Mit 10 Jahren sehr sportlich, spielte nicht mit Puppen; wünschte, ein Junge zu sein; entwickelte Phobien vor Verstümmelungen, vor Zähneziehen und Zahnärzten.

In der Pubertät flegelig, starke Widerstände gegen ihre körperliche Entwicklung, leichte anorektische Züge, lehnte Mutterschaft ab, fand die Schwangerschaft ihrer Mutter erniedrigend und lebensgefährlich.

Später in verschiedenen Haushaltstellen regelmässig Angst, vom Hausherrn sexuell attackiert zu werden, obwohl dafür meist gar keine Anhaltspunkte.

Vorübergehend befreundet mit einem sehr zurückhaltenden Gleichaltrigen, der im Kriege fiel; keine körperlichen Kontakte.

Mit 25 Jahren kam sie an eine neue Stelle, wo ihr Hausherr sie sofort faszinierte als ein herrischer, "hypnotisch" wirkender Mann. Er umwarb sie ein Jahr lang und quälte sie sehr, da sie ihn abwies. Schliesslich begann ein 2-jähriges intensiv schuldbeladenes Verhältnis, in dem die Pat. kaum je orgasmusfähig war. Während dieser Zeit wohnte erst die Ehefrau, dann deren Nachfolgerin mit im Haushalt.

In den ersten Monaten dieses Verhältnisses beginnt ein Hirsutismus im Gesicht, den die Pat. sofort als Strafe und als beginnende Geschlechtsumwandlung interpretiert. Sie lässt ihre Mutter kommen: "Du hast mich geboren, du musst wissen, ob ich ein Junge oder ein Mädchen bin." Hasst und verabscheut sich selbst, empfindet sich als "Mann-Weib" und ist überzeugt, mit ihr sei "alles verquer".

In der Folge übernimmt sie einen Arbeitsplatz im Unternehmen des Hausherrn, welchen vorher die frühere Frau innehatte, löst aber das Verhältnis mit ihm und zieht sich völlig zurück; sie vermeidet und fürchtet soziale Kontakte; errötet leicht, wird verwirrt und beginnt zu schwitzen, wenn sie im Beruf um Auskunft gebeten wird. Sie kasteit sich mit Sauna, Gymnastik und Diät, beginnt

ihre Emotionalität abzusperren, kann sich überhaupt nicht mehr durchsetzen und führt in einem ungeheizten Zimmerchen ein schizoides Kümmerdasein. Seit Auftreten der männlichen Gesichtsbehaarung hat sie schon annähernd 1000.—DM für deren kosmetische Beseitigung ausgegeben.

Die Grundstimmung ist ernst, hoffnungsarm, leicht verzweifelt, aber nicht vital-depressiv. Keine Störung der Gesamtantriebshaftigkeit; Neigung zu Obstipation, Verlust der Libido, sonst keine Störungen der "Einzeltriebe".

Beurteilung: Leichte Beeinträchtigung der sozialen und beruflichen Möglichkeiten, indem die Pat. durch ihre masochistische Fixierung an den Chef in einer subalternen und schlecht bezahlten Stellung bleibt; schizoide Entwicklung mit schwerer Beeinträchtigung des Lebensgenusses und mittelgradiger Verminderung der Verwirklichung ihrer persönlichen Möglichkeiten.

Ergebnisse der Testuntersuchung von E. K. (ausschnittweise dargestellt)

HAWIE (Gesamttest): IQ = 99 (durchschnittliche Intelligenz: 90–109).

MMQ: Lügenwert = 12 (zweifelhaft interpretierbar: 10–12); Neurotische Tendenz = 26 (abnorm: 20–26).

TABELLE 4.—P–I–T VON E. K.
(Persönlichkeitsteil)

Quartilbereiche			Erklärungen
$<Q_1$	$Q_1 - Q_3$	$>Q_3$	
A−	A+		Selbstkritik
B+	B−		soz. Einstellung
	C+/C−		Introv.-Extraversion
D+		D−	neurot. Tendenz
E−	E+		manische Tendenz
F+		F−	depressive Tendenz
G+		G−	schizoide Tendenz
	H+/H−		paranoide Tendenz
I+		I−	vegetat. Labilität

P–I–T (Persönlichkeitsteil) siehe Tabelle 4. Abweichungen am stärksten in den Kategorien D, F, G, J, und zwar jeweils zur negativen Seite hin, d.h. zum "Neurotischen", "Depressiven", "Schizoiden" und zur "vegetativen Labilität".

P–F–T (Kategorien, Faktoren und "Group-Conformity-Rating"). Von der Norm abweichendes Reagieren auf soziale Belastungssituationen (GCR $< Q_1$): Tendenz, die in solchen Situationen geweckten Aggressionen gegen das eigene Ich (Schuldgefühle) zu richten oder sie ganz zu umgehen, verstärkt (Faktoren I und M $> Q_3$); dagegen Tendenz, sie zur sachlichen Lösung der Situation zu verwerten, vermindert (alle Faktoren der Kategorie N–P $< Q_1$).

Rorschach-Test (ohne thematische Analyse) siehe Tabelle 5. Bild einer reaktiven Depression mit Zeichen von Angst und schizoiden Zügen (geringe Antwortenzahl; durchschnittliche Zeit pro Antwort an der oberen Normgrenze; verlängerte durchschnittliche Reaktionszeit pro Tafel; Fehlen irgendwelcher—auch unbunter—Farbantworten; hohes A%; M-Inhalte: H < (H) + Hd; u.a.).

HTP (Mensch-Zeichnung mit "Post-Drawing-Interview" = PDI). Mensch-Zeichnung: Frau, Hände hinter dem Rücken versteckt.

PDI, P 1 (Mann oder Frau?): "Ja, also der Kopf sieht direkt ein bisschen männlich aus, die Gesichtszüge etwas männlich—das soll ja wohl eine Frau sein, ja, das soll eine Frau sein."

P 10 (woran erinnert Sie dieser Mensch?): "An mich selbst". Deutliche Identifikation (PDI, P 10); Zeichen von Kontaktscheu (Menschdarstellung ohne Hände); starke Unsicherheit der sexuellen Identifikation (PDI, P 1).

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TABELLE 5.—RORSCHACH-"SCORES" VON E. K.

$R = 15 : \frac{T}{R} = 1$ min	Highest form-level = +2,5
Average reaction time (Card I–X) = 46,6 sec	Weighted form-level = +1,6
Longest reaction time (Card VII) = 135,0 sec	Lowest form-level = −1,0

W = 33%	M = 3 (+2 ad)	k = 0	FK = 1		c = 0	FC = 0	$\frac{A + Ad}{R} = 67\%$
D = 60%	FM = 5	K = 0	F = 5 (+4 ad)	C′ = 0		CF = 0	
d = 0%	m = 0 (+2 ad)		Fc = 1			C = 0	P = 5
Dd/S = 7%							O = 1

M-content: 1 H = Card III, W (2 Frauen)
1 (H) = Card X, D_1 (2 kl. Teufel)
1 (H) → (A) = Card IV, W (Missgeburt → Untier)
+2 ad Hd = Card X, 2 dr in D_9 (2 Köpfe)

Zusammenfassung der Testergebnisse

Typisches Testprofil einer hirsuten Frau: Durchschnittlich intelligent, aber emotionell gestört im Sinne einer reaktiven Depression mit schizoiden Zügen, d.h. Absperrung der Affekte und Einschränkung des Umwelt-Kontakts; dazu deutliche Zeichen einer Unsicherheit in der weiblichen Geschlechtsrolle.

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E. BESPRECHUNG

1. *Repräsentativität*

Wie mehrfach erwähnt, kann die von uns untersuchte Stichprobe von Frauen mit gewöhnlichem Hirsutismus als repräsentativ für ein Gesamtkollektiv von 42 Fällen einer norddeutschen Klinikpopulation angesehen werden. In dieser Feststellung liegt zugleich eine Einschränkung: Die aus unserer Untersuchung gezogenen Folgerungen dürfen nur mit Vorbehalt auf andere Kollektive, etwa die Gesamtheit aller deutschen oder mittel—und nordeuropäischen Frauen mit diesem Syndrom—also einschliesslich derer, die keinen Arzt aufsuchen—verallgemeinert werden. Noch mehr gilt das natürlich für ihre Übertragung auf Angehörige fremder Rassen und Kulturen (eine persische Pat. armenischer Herkunft aus unserer Stichprobe—A. H.—zeigte allerdings einige der typischen Züge der Gruppe in ausgeprägter Form). Mit diesen Einschränkungen lassen sich folgende Aussagen treffen:

2. *Art der psychischen Störungen*

Der auffallendste Befund ist, dass sämtliche Pat. unserer Hirsutismus-Stichprobe psychisch gestört sind. Innerhalb ganz verschiedener Strukturen und Syndrome finden sich zwei Gemeinsamkeiten, die miteinander in Verbindung stehen: Eine *Störung der Geschlechtsrolle* und eine Persönlichkeitsveränderung mit reaktiv-depressiven Zügen und Störungen des zwischenmenschlichen Verhaltens, die wir unter dem Stichwort *Akzeptationskomplex* besprechen.

Bei fast Zwei-Drittel der Fälle unserer Stichprobe—finden sich ganz bestimmte Störungen der weiblichen Geschlechtsrolle. Positiv formuliert betrifft die Störung die innere Einstellung zur Geschlechtsrolle und geht von einer

blossen Ablehnung einzelner Teilaspekte Der Weiblichkeit (Mutterschaft; Nur-Hausfrau; Biologie mit Menses etc.) ohne fassbare Peniswünsche, über einzelne virile Züge bis zur Androgynie oder sogar mehrheitlich männlichen Tendenzen.

Diese häufig gefundenen virilen Züge haben aber innerhalb der verschiedenen Persönlichkeitsstrukturen eine unterschiedliche Stellung. Es lassen sich dabei zwei Extreme unterscheiden (und dazwischen beliebige Übergänge): In einem Falle sind die virilen Züge weitgehend angst- und schuldfrei; bei diesen Pat. sind sie nämlich ichgerecht und entsprechend bewusst oder bewusstseinsnah und finden sich strukturell im Ideal-Ich oder—soweit sie verwirklicht wurden—im Ich und im Selbstbild. Im gegensätzlichen Fall sind die virilen Züge persönlichkeitsunverträglich, schuldbeladen und angstbesetzt; sie werden entsprechend abgewehrt (d.h. verdrängt, isoliert, projiziert etc.) und finden sich nur als relativ entstellte Es-Abkömmlinge in bestimmten phobischen oder anderen psychischen Symptomen oder allenfalls als unbewusste Ichanteile.

Diese virilen Züge sind nicht qualitativ spezifisch für den Hirsutismus, höchstens quantitativ, indem sie sich häufiger und deutlicher finden als beim Gros der weiblichen Neurotiker. Hingegen ist das subjektive Erleben recht spezifisch: Es kommt zu einer tiefgehenden Unsicherheit über die eigene Geschlechtsrolle. Dies zeigt sich klinisch in der Vorstellung der Pat., eine Geschlechtsumwandlung zu erleben. Noch deutlicher wird dies in den Tests: im "Post-Drawing-Interview" zum HTP macht fast die Hälfte der Pat. einschränkende Bemerkungen über das Geschlecht der gezeichneten Personen, und im Rorschach-Test finden sich unter den menschlichen Bewegungsantworten gehäuft die geschlechts-indifferenten; in beidem wird ein Ausweichen vor der Konfrontierung mit umrissenen Geschlechtsrollen deutlich.

Der Grund für die im Vergleich zu anderen weiblichen Neurotikern deutlichere Fassbarkeit der virilen Züge wie auch für die Unsicherheit über die eigene Geschlechtsrolle liegt offenbar im Hirsutismus, diesem äusserlich sichtbaren und körperlich greifbaren Stigma des Hermaphroditismus.

Was Ablehnung oder Annahme des Hirsutismus betrifft, so wird er analog behandelt, wie die "psychischen Virilismen"; doch sind für seine Ablehnung die psychischen Abwehrmechanismen untauglich. In jedem Falle akzentuiert sein Auftreten die psychische Problematik: Liegen ichgerechte und bewusstseinsnahe virile Tendenzen vor, so werden diese unterstützt; sind sie verpönt und nur als unbewusste Wünsche vorhanden, werden sie ihres Wunschcharakters entkleidet; die Pat. werden mit der konkreten Realisierung konfrontiert. Diese Drohung der realen Vermännlichung aktiviert, verschärft und entharmlost die vorher infantil-spielerischen, weitgehend unbewussten Peniswünsche.

Das kann sogar geschehen, wenn der Peniswunsch ichgerecht und völlig bewusst war.

Das krasseste Beispiel hierfür liefert C. S., die nicht nur den bewussten Wunsch hegte, ein Mann zu werden, sondern auch magische Praktiken unternahm, diesen Wunsch zu realisieren, indem sie sich jeden Abend auf ihr Bett legte und sich ganz intensiv auf die Vorstellung konzentrierte, bereits ein Mann zu sein. Als dann—nach einem halben Jahr—ihr Bartwuchs begann, schreckte sie entsetzt zurück: 'Der Wunsch war doch nur für die Nacht; am Tage bin ich doch ein Mädchen.'

Aber auch von den 6 Pat. (M. B.; A. H.; H. M.; B. R.; M. H.; H. S.), deren virile Tendenzen so ichgerecht sind, dass sie ihren Hirsutismus weitgehend akzeptieren, zeigen nur 2 (B. R. und H. S.) ein eigentlich bisexuelles Verhalten.

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Damit müssen wir die Störungen der Geschlechtsrolle ausserdem noch negativ umschreiben: Diese Störung betrifft nicht das äussere Verhalten (ausgenommen H. M.) und auch nicht die Partnerwahl (im Sinne der manifesten und gelebten Homosexualität); wir haben nur eine Pat. mit homosexuellem verhalten (H. S.) und eine weitere mit bewusstwerdenden homosexuellen Impulsen (B. R.). Dies scheint uns—auch angesichts der starken Schwankungen in den Angaben über deren durchschnittliche Häufigkeit (vgl. KINSEY *et al.*, 1954)—keine Häufung gegenüber der Durchschnittsbevölkerung oder gar einer Gruppe von Neurotikern.—(Wegen dieser Vermeidung gelebter Bisexualität sprechen wir bei den Pat., wo die Tendenzen beider Geschlechter vertreten sind, lieber von Androgynie.)

Sicher betroffen wird die soziale Einordnung durch die Unsicherheit in der Geschlechtsrolle insofern, als der sexuelle Kontakt zum Mann und auch die Ehe eher abgelehnt und vermieden werden: Eine soziologische Form der Vermeidung der Differenzierung in männlich–weiblich. Allerdings scheint bei der bewiesenen Verminderung stabiler heterosexueller Partnerbindungen (Ehe) noch stärker die anschliessend zu beschreibende Akzeptationsproblematik ins Gewicht zu fallen.

Die neurotischen Züge der erwähnten 6 Pat., die ihre virilen Persönlichkeitstendenzen und analog dazu auch den Hirsutismus weitgehend akzeptieren, sind leicht verständlich, soweit sie in der Androgynie bzw. virilen Identifikation bestehen. In diesem Sinne fallen H. M., B. R. und H. S. hauptsächlich dadurch auf, dass sie ihre fraulichen Möglichkeiten nicht in reifer Weise entwickelt haben, während sie subjektiv nicht oder nur indirekt (H. S.) leiden. (Auf die Zwangsneurose von M. B. kommen wir noch zurück.)

Drei dieser Pat. mit gewisser viriler Identifikation (A. H., M. H.; H. S.) akzeptieren jedoch ihren Hirsutismus nicht ganz. In dieser Hinsicht gehören sie zu jener Hälfte unserer Stichprobe, die ihren Hirsutismus ablehnt and dadurch in eine 'Akzeptationsproblematik' gerät. (Intensiv lehnen E. K. M. T., U. G., D. S. und auch C. S. ihren Hirsutismus ab, weniger stark tun dies M. O., A. H., M. H. und H. S.)

Dies ist offenbar so zu verstehen: Der Hirsutismus verändert das Selbstbild, es entspricht nicht mehr dem Ideal-Ich, die Behaarung wird zur Verunstaltung; dadurch wird das Selbstwertgefühl vermindert. Die Ablehnung des Hirsutismus kann sich auf die ganze Person ausdehnen, die Pat. akzeptieren sich selbst nicht mehr; ja, es kann zu eigentlichem Selbsthass kommen. Häufiger noch—besonders was die leichteren Ausprägungen dieser Akzeptationsproblematik betrifft—kommt es zu einer Akzeptationsangst gegenüber der Mitwelt. Von hier aus lassen sich viele Symptome in ein zusammenhängendes psychodynamisches Gefüge (pattern) bringen, sowohl viele der emotionellen wie der Verhaltensstörungen, wie auch ein Teil der vegetativen Symptomatik.

So z.B. die reaktive Depression—die auch im Rorschach-Test und im P–I–T (Kategorie F) deutlich wurde—, denn ihr erlebnismässiger Inhalt ist der Hirsutismus bzw. das Gefühl seinetwegen verspottet, verabscheut und gemieden, kurz: abgelehnt zu werden. Das Entdeckt- und Abgelehntwerden wird angstvoll gefürchtet; die Benachteiligung durch den Hirsutismus und die sekundären exhibitionsvermeidenden Einschränkungen werden mit Trauer und evtl. Scham beantwortet.

Aus dieser Einstellung heraus kommt es zu Beachtungsgefühlen, wobei meist die Kritik erhalten bleibt. Diese Affekte sind weder beherrschend noch dauernd im Vordergrund wie bei einer akuten reaktiven Depression, aber sie sind latent da: eine ganz harmlose Bemerkung, ja schon eine gedankliche Assoziation, geschweige denn verbalisierter Spott genügen, um die Pat. traurig verstimmt zu

machen. Man könnte von einer chronischen reaktiven Depression sprechen. Die dauernde latente Ängstlichkeit drückt sich naturgemäss im Vegetativen aus; es sind die Pat. mit den Akzeptationsproblemen (und natürlich die beiden angstneurotischen Pat.), die die Symptome einer vegetativen Dystonie: Schwitzen, Herzklopfen, Erröten, Schwindel, Zittern und auch Kopfweh zeigen. Im P–I–T drückt sich das in der signifikanten Verminderung der vegetativen Stabilität (J+) aus.

Das Kopfweh—häufig ein Zeichen unterdrückter Aggressionen—weist auf eine weitere Folge der Akzeptationsproblematik hin: Im Ringen um das Angenommenwerden vermeidet man Aggressionen, indem sie z.B. verdrängt oder gehemmt oder auf sich selbst zurückgewendet werden. Das letzter—metapsychologisch bzw. destrudo-ökonomisch betrachtet—könnte eine der Quellen des Selbsthasses sein. Diese Tendenz zur Aggressionsvermeidung konnte im P–F–T mit statistischer Signifikanz bewiesen werden.

Als Verhaltensstörungen im Rahmen der Akzeptationsproblematik finden sich die Exhibitionshemmung, der Autismus und vereinzelt eine "schizoide Entwicklung", die wir im klinischen Teil beschrieben haben und denen im P–I–T—neben gewissen Einzel-"Symptomen"—die signifikante Extraversionsverminderung entspricht, ausserdem im HTP das sehr signifikant häufige Fehlen der Hände und im Rorschach-Test vor allem das Überwiegen von (Fc + c + C') über [FC + CF + C]. Diese allgemeine Rückzugstendenz wird auch soziologisch fassbar: Hirsutismus-Pat. sind sehr signifikant häufiger ledig oder geschieden, als es nach dem Durchschnitt sowohl in der Bundesrepublik wie auch unserer weiblichen Poliklinik-Population zu erwarten wäre.

In diesen Zusammenhang passen ferner die Störungen der Sexualität und die Virginität bei z.T. schon älteren Pat., ohne dass wir bei einer Gruppe von Neurotikern dies als spezifisch ansehen würden.

Folgende Befunde belegen, dass der Begriff der Selbstwertminderung nicht ausreicht, um das Vollbild dieser Akzeptationsproblematik und insbesondere ihre Intensität verständlich zu machen: Es findet sich eine krasse Überbewertung der realen Verhältnisse und entsprechend überschiessende Reaktionen; denn nach unseren Beobachtungen ist die Ablehnung des Hirsutismus durch andere, insbesondere durch Männer, nicht derart intensiv; als Beleg kann die Erfahrung von G. G. dienen, dass ihr Bartwuchs den Männern immer gefallen habe. Ferner kann man weder den Selbsthass noch die Schuldgefühle einzelner Pat. mit dem Begriff der Selbswertminderung erklären.

Es handelt sich vielmehr um eine komplexhafte, also neurotische Reaktion; man kann deshalb von einem *Akzeptationskomplex* sprechen.

Natürlich ist dieser Akzeptationskomplex nicht spezifisch für den Hirsutismus; ähnliche Veränderungen können als Ausdruck beliebiger Mängel entstehen, die subjektiv stark empfunden werden: Strabismus, Gibbus, Onanie etc. Eine anders gelagerte Akzeptationsproblematik kann auf Grund—echter oder vermeintlicher—Ablehnung durch Beziehungspersonen entstehen.

Vernachlässigt haben wir bis jetzt die Rolle des Narzissmus, der natürlich die Akzeptation des Hirsutismus erschwert. H. S. erlebt ihn trotz ihrer Androgynie als narzisstische Kränkung und entwickelt eine leichte Exhibitionshemmung; bei U. G. verschärft er den Akzeptationskomplex erheblich; umgekehrt kann sein weitgehendes Fehlen einen Hirsutismus auch für eine weiblich identifizierte Frau annehmbar machen. Dies zeigt E. W., die ihre Weiblichkeit völlig unter dem Aspekt des masochistischen Dienens, Unterwerfens und Gehorchens sieht und ihren Hirsutismus akzeptiert. Ein Spezialfall ist G. G., bei der der Akzeptationskomplex auf den Gibbus fixiert bleibt. Weitere Ausnahmen wären denkbar; wir konnten keine beobachten.

Offen geblieben ist die Besprechung der *unspezifischen neurotischen Züge:* d.h. der Symptomatik, die bei den Pat. mit hirsutismusbedingtem Akzeptationskomplex

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nicht auf diesen zurückzuführen ist, und derjenigen, die bei den Pat., die ihren Hirsutismus akzeptieren, nicht mit der virilen Identifikation bzw. Androgynie zusammenhängt; im Speziellen also die angstneurotische Symptomatik von E. W. und B. G., die zwangsneurotische von M. B. und die phobische von M. T. Möglicherweise hängt das mit einer emotionellen Auslösbarkeit des gewöhnlichen Hirsutismus zusammen, die wir unten besprechen.

3. *Abgrenzung gegen andere psychische Störungen*

Die von uns gefundenen Störungen passen klinisch ins Bild der "Neurosen". Sie zeigen auch die entsprechenden Zeichen im Rorschach, MMQ und P–I–T. Angesichts der guten Lebensbewährung und des subjektiven Leidens gehören sie nicht zu den "Psychopathien"; ein Begriff, der seinen Platz in der psychoanalytischen Ich-Theorie hat, wenn man darunter jene Charakterneurosen versteht, die sozial unangepasst sind, d.h. Verwahrlosungszüge aufweisen, und infolge eines Über-Ich-Defekts nicht darunter leiden. In diesem Sinne könnten die Störungen von M. O., B. R. und H. S. zu den Psychopathien gerechnet werden. (M. O. hat jedoch früher unter einer Agarophobie gelitten und bietet jetzt das Sympton eines "Konversions-Hustens".) Bei B. R. und H. S. liegt das Schwergewicht auf dem agierenden Rollenspielen, das nur solange nicht mit subjektivem Leiden verbunden ist, als sie sich in einer Bohème-Gruppe bewegen, die eine grosse Variabilität an sozialen Verhaltensweisen zulässt.

"Psychosen" sind offenbar nicht die Regel: nur eine Pat. unserer Stichprobe (C. S.) ist psychosenah, ein "Grenzfall".

Es scheint sich bei den Störungen auch nicht um vorwiegend "konstitutionelle psychische Anomalien" zu handeln, wie z. B.beim Klinefelter- oder beim Turner-Syndrom; denn im Gegensatz dazu zeigen unsere Fälle keinen auffälligen Mangel an affektiver und intellektueller Differenzierung und ihre Störungen sind tiefenpsychologisch verstehbar.

Das bedeutet natürlich nicht, dass konstitutionelle Momente völlig ausgeschlossen sind; vielmehr dürften sie als dispositionelle Grundlage eine bedeutsame Rolle bei der Entstehung der neurotischen Störungen spielen. Dafür spricht u.a., dass bei Neurotikern körperliche Konstitutionsanomalien verschiedener Art und verschiedenen Grades relativ häufig vorkommen (vgl. KRETSCHMER 1952; COPPEN, 1959). Die psychischen Störungen weichen aber in diesen Fällen nicht grundsätzlich ab von denen, die man bei Neurotikern mit normalem körperlichem Habitus antrifft.

Ausfälle im Sinne des "organischen Psychosyndroms" finden sich weder klinisch noch in den Tests.

Da 12 unserer 15 Pat. endokrine Abweichungen im Sinne einer leichten, aber sicheren Störung der Androgenausscheidung aufweisen (vgl. v. ZERSSEN *et al.*, 1960; AHRENS, 1960), stellt sich die Frage nach dem "endokrinen bzw. hirnlokalen Psychosyndrom" (vgl. BLEULER, 1954). (Keine Abweichungen der Androgen-Ausscheidung bestehen bei E. W.; G. G. u. M. H.). Im Gegensatz zu anderen Endokrinopathien mit Störungen der Steroidproduktion, wie Cushing-Syndrom, Morbus Addison und Hypophysenvorderlappeninsuffizienz, wo wir solche psychischen Veränderungen in Übereinstimmung mit den in der Literatur vorliegenden Angaben (BLEULER, 1954) fanden, können wir sie hier nicht nachweisen. Bei einer endokrinen Variante, die nur geringe Grade erreicht, nicht höhere, als den Hormonwerten gesunder junger Männer entspricht (GALLAGHER *et al.*, 1958), ist das vielleicht auch nicht zu erwarten.

Eine Verwechslung mit dem endokrinen Psychosyndrom liegt nahe bei den beiden angstneurotischen Pat., besonders bei E. W., die aber endokrin nicht nachweisbar gestört ist; dafür besteht bei ihr eine Hepatopathie und ein labiler Hypertonus. Im übrigen finden sich zwar Verstimmungen und noch häufiger Verstimmbarkeit, die aber erlebnis-reaktiv zu erklären sind. Störungen der 'Einzeltriebe' sind auch bei Neurotikern häufig; bei unserer Gruppe sehen wir sie im Einzelfall mit einer entsprechenden Problematik verknüpft.

4. *Vergleiche mit den Befunden anderer Autoren*

Französische Endokrinologen (VAGUE *et al.*, 1959) konnten bei 31,5% der Sippenmitglieder ihres grossen Kraukengnts von hirsuten Pat. ebenfalls einen Hirsutismus eruieren und bei 5% eine Psychose. Wir haben 135 Sippenmitglieder von 15 hirsuten Frauen erfasst; nach diesen Erhebungen liegt bei ungefähr der Hälfte unserer Fälle eine—allerdings geringe—familiäre Belastung mit Hirsutismus vor: nur M. B. und M. T. haben je 2 Fälle in ihrer Familie, die anderen je einen oder gar keinen. An schweren psychischen Störungen finden wir unter den Blutsverwandten unserer Pat. 3 Psychosen (1 davon fraglich), einen Suicid und eine Zwangsneurose. Die familiäre Belastung mit Hirsutismus wird also auch durch unsere Erhebungen belegt. Was die Häufigkeit schwerer psychischer Störungen in den Familien hirsuter Frauen anbelangt, ist dagegen unser eigenes Material zahlenmässig zu klein, um daraus Schlussfolgerungen abzuleiten.

Die genannten Autoren geben ferner an, dass sie bei 87% der hirsuten Frauen vegetative Dystonien und bei 76,6% von ihnen Charakterstörungen finden, die im klinischen Bild genauso gewichtig sind wie die Behaarung. Damit stimmen unsere Befunde weitgehend überein, sie erlauben zudem eine genauere Erfassung und Strukturierung dieser psychischen Störungen.

Gegenüber dem congenitalen adrenogenitalen Syndrom (AGS) scheinen neben Gemeinsamkeiten auch gewisse Unterschiede zu bestehen. Wir besprechen nur die jüngeren Arbeiten (für die ältere Literatur siehe ZÜBLIN, 1953a).

An Gemeinsamkeiten finden sich nach der Beschreibung von ZÜBLIN (1953a, b) Exhibitionshemmung bis zur Einschränkung sozialen Kontaktes, reaktive Traurigkeit und Aggressionshemmung; auch BIERICH (1958) betont die Kontaktstörungen. Von HAMPSON (1955) und MONEY *et al.* (1955) wird ein Syndrom beschrieben, dem diese Autoren ein "übertriebenes Funktionieren der Kontroll- und Hemmungsfunktionen der Persönlichkeit" zugrundelegen, und das sich in Schüchternheit, Misstrauen und Sprechhemmung zeigt. Dabei betonen diese amerikanischen Autoren, dass psychische Störungen dieser und anderer Art nicht besonders häufig und schwer sind: Von 48 Pat. seien nur 19 gestört, davon nur 1 erheblich, 6 mässig und 12 leicht.

WALLIS (1958) findet kaum deutliche Züge aus dem Akzeptationskomplex und betont, dass die Pat. ihre entstellte äussere Erscheinung in erstaunlich kritikloser Weise unbeachtet lassen.

Übereinstimmend finden die Autoren eine wenig entwickelte Sexualität (auch bei Fällen von körperlicher Frühreife), die auch gewöhnlich nicht homosexuell gerichtet ist.

WALLIS findet speziell einen Mangel an persönlicher Entfaltung mit unselbständigem Sichformen- und Sicheinpassenlassen, was den Eindruck von Infantilität erweckt, den schon ZÜBLIN feststellte. Weder WALLIS noch ZÜBLIN finden unspezifische neurotische Symptome in gehäuftem Masse; der letztere hingegen gewisse Züge aus dem "endokrinen Psychosyndrom".

Auf Grund der Befunde der erwähnten Autoren ist wahrscheinlich, dass es beim congenitalen AGS seltener zu einem Akzeptationskomplex und auch seltener sowohl zur Androgynie wie auch zu unspezifischer neurotischer Symptomatik kommt. Dafür findet sich häufiger eine Infantilität mit Passivität, unoriginellem Denken und gefügigem Sicheinpassen, ferner Störungen der Antriebshaftigkeit.

Die Unterschiede scheinen erklärbar: einmal durch die Tatsache, dass viele der AGS-Pat. noch im Kindesalter sind mit seinen ganz anderen Anpassungsmöglichkeiten, z.B. dem von WALLIS beobachteten Skotomisieren der eigenen körperlichen Verunstaltung und ferner der Lösung des Akzeptationsproblems durch kindliche Gefügigkeit; zum anderen durch die erheblich schwerere, in Teilaspekten dem Morbus Addison nahekommende (BIERICH, 1958) endokrine Störung.

Genaue Vergleiche sind schwer, da keiner der Autoren psychometrische Testdaten angibt und die klinischen Masstäbe naturgemäss verschiedenseind; z.B. legen die amerikanischen Autoren im Unterschied zu den europäischen das Gewicht hauptsächlich auf die soziale Bewährung bzw. das Meistern von Problemen ohne fremde Hilfe.

5. *Diskussion des "Psychogenie"-Problems*

Von endokrinologischer Seite wurde die emotionelle Auslösbarkeit des gewöhnlichen Hirsutismus hervorgehoben.

MERIVALE (1951) fand unter 10 Pat. 4, deren Hirsutismus gleichzeitig mit schweren emotionellen Belastungen auftrat. BUSH und MAHESH (1959) untersuchten einen emotionell ausgelösten Hirsutismus und fanden bei der monozygoten Zwillingsschwester, die keinen Hirsutismus aufwies, dieselbe Steroidabweichung, aber in viel geringerem Grad. Sie nehmen an, dass bei vorbestehender adrenocorticaler Dysfunktion durch die stressbedingte Steigerung der Steroidproduktion (via ACTH-Ausschüttung) der kritische Androgenwert erreicht wird, womit der Hirsutismus entsteht.

Wir finden (siehe Tabelle 3) bei 7 Pat. akute Konfliktsituationen, die mit dem Auftreten des Hirsutismus konkomitieren, teils sehr dramatische (E. K.; C. S.; B. G.), teils deutliche (G. G.; M. T.; H. M.; M. H.); bei weiteren 3 finden sich chronische Konfliktsituationen (E. W.; D. S.; H. S.); bei M. B. ist das fraglich, bei M. O. und B. R. ist es wegen der Abwehrhaltung nicht zu beurteilen.

Diese Befunde sind insofern einzuschränken, als sich die Pat. G. G., H. M., M. H., D. S. und H. S. z.Zt. der Konflikte in der Pubertät befanden, wo seeliche Spannungen die Regel sind.

Damit können wir die Befunde von MERIVALE und von BUSH u. MAHESH. bestätigen: Emotionelle Konflikte sind z.Zt. der Entwicklung eines Hirsutismus oder während einer Zunahme desselben offenbar sehr häufig; sie kommen aber nicht in allen Fällen vor.

Bei einem Fall (A. H., Armenierin mit leichter familiärer Belastung) glauben wir, dass weder eine seelische Konfliktsituation noch ein körperlicher Stress vorgelegen hat, bei einer anderen (U. G.), deren traurige Verstimmung die Beurteilung der erwähnten Konfliktsituation schwer macht, scheint ein hauptsächlich körperlicher Stress (Hirnoperation wegen Aneurysmablutung) den Hirsutismus ausgelöst zu haben (eher vielleicht hat die Operation sein Auftreten beschleunigt oder akut verschlimmert, denn Periodenstörungen gingen der Operation schon ein Vierteljahr voraus). Ähnlich liegen die Verhältnisse bei E. W., wo sich der vorbestehende Hirsutismus nach einer schoeren Hepatitis erheblich verschlimmerte.

Wenn eine emotionelle Auslösung möglich ist, könnte dies die unspezifischen neurotischen Symptome beim gewöhnlichen Hirsutismus erklären: Unter den Pat. mit latenter Androgenerhöhung (entsprechend der Annahme von BUSH) besteht für die neurotischen eine viel höhere Wahrscheinlichkeit, in einen schweren emotionellen Stress zu geraten und dadurch einen manifesten Hirsutismus zu entwickeln.

ROTTINI und ANTONELLI (1959) beschrieben einen Fall, bei dem sie eine ganz spezifische Psychogenese annehmen: Hirsutismus als Ausdruck unbewusster viriler Strebungen.

Prüfen wir bei unseren Fällen die Konfliktsituationen auf einen gemeinsamen Nenner, so könnte es sich um Situationen handeln, in der sich die Pat.—mit oder ohne äusseren Druck—in eine weibliche Rolle begeben, der sie sich nicht gewachsen fühlen, weil sie diese aus inneren Gründen überhaupt ablehnen oder weil sie ihnen zu konflikthaft ist. Dies könnte man annehmen bei E. K., G. G., M. T., C. S., H. M., B. G. und unter Umständen auch für E. W., U. G., M. H. und H. S.. Dies ist darum eine wenig beweiskräftige Konstruktion, weil eine Konfliktsituation bei der Frau praktisch immer auch ihre weibliche Rolle mitbetrifft.

Solche Fragen können mit unserer Methodik nicht entschieden werden. Die Psychophysiologie muss klären, ob psychische Faktoren einen spezifischen Einfluss auf die Androgenproduktion bei Frauen ausüben, und wenn ja, welchen und auf welchem Wege. Z.Zt. ist noch nicht einmal schlüssig entschieden, ob der Androgen-Überschuss in allen Fällen und ausschliesslich aus der Nebenniere kommt (vgl. VAGUE, 1959), geschweige denn, wie er gesteuert wird.

Auf die einleitend gestellten Fragen gehen wir im Rahmen der Zusammenfassung gesondert ein.

F. ZUSAMMENFASSUNG

(1) Es wird über psychologische Untersuchungen an Frauen mit gewöhnlichem oder sogenanntem idiopathischem Hirsutismus (i.H.) berichtet, die der Klärung folgender Fragen dienten:

(a) Besteht häufig ein Leidensdruck und bei welchen Frauen? Worauf beruht er?

(b) Kommen darüberhinaus psychische Störungen vor und welcher Art sind sie (angeborene Anomalie, "endokrines Psychosyndrom" oder psychisch-reaktive Störungen)?

(c) Finden sich Anhaltspunkte für eine emotionelle Auslösung des i.H., evtl. in einem spezifischen Sinne, d.h. dem einer eigentlichen "Psychogenie"?

(d) Welche Beziehungen bestehen zu der schon erforschten Psychologie des andrenogenitalen Syndroms (AGS)?

(2) Die Grundlage der Untersuchung bildeten die Krankengeschichten von 42 H.-Fällen unserer Klinik. Eine repräsentative Stichprobe von 15 Fällen konnte im Verlauf eines Jahres stationär eingehend von uns untersucht werden.

(3) Von den Pat. des Gesamtkollektivs wurden die soziologischen Daten und die Anamnesen ausgewertet; die 15 Pat. der Stichprobe wurden darüberhinaus während eines mehrwöchigen Klinikaufenthaltes psychiatrisch-tiefenpsychologisch exploriert (M.) und mit einer Reihe psychometrischer und projektiver Verfahren getestet (v.Z.). Die so gewonnenen Daten wurden, soweit möglich, statistisch verarbeitet und auf ihre Signifikanz geprüft.

(4) Auf Grund der Angaben über den sozioökonomischen Status der 42 Fälle des Gesamtkollektivs lässt sich nachweisen, dass gegenüber der Durchschnittsbevölkerung bei hirsuten (h.) Frauen das Verhältnis der verheirateten bzw. verwitweten zu den ledigen oder geschiedenen sehr signifikant zu Gunsten der letzteren verschoben ist ($p < 0{,}01$). Das spricht für eine Beeinträchtigung intensiver und stabiler heterosexueller Partnerbeziehungen. Die Ursache dafür liegt nach unserer Stichprobenuntersuchung nicht in einer Ablehnung des H. durch die Männer, sondern umgekehrt in einer Ablehnung sexueller Kontakte durch die h. Frauen. Dies wird verständlich aus der psychischen Situation solcher Frauen, wie sie durch die Stichprobenuntersuchung erhellt wird:

(5) Klinisch bieten alle Frauen der Stichprobe deutliche Zeichen einer emotionellen Störung, von der die Lebensbewährung kaum betroffen wird, wohl aber die persönliche Reifung und die subjektive Zufriedenheit. Die Störung zeigt—bei sonst durchaus verschiedenen Persönlichkeitsstrukturen—gewisse Gemeinsamkeiten, die sich in zwei Gruppen unterteilen lassen.

(6) Die erste Gruppe gemeinsamer Züge umfasst Symptome einer reaktiven Verstimmbarkeit, Einschränkungen des Umweltkontakts mit Exhibitionshemmung und autistischen Zügen, Frigidität oder Coitusabwehr, sowie verschiedene vegetative Störungen. Diese Symptome finden sich vorwiegend bei denjenigen Pat., die ihren H. als viriles Stigma ablehnen, wie sie auch virile Züge ihrer Persönlichkeit nicht integrieren konnten; weniger deutlich treten sie da in Erscheinung, wo der H. lediglich aus einer narzisstischen Haltung heraus als ästhetischer Makel empfunden wird.

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Die Ablehnung des H. kann sich auf die ganze Persönlichkeit ausdehnen: Die Pat. akzeptieren sich selbst nicht mehr oder geraten der Umwelt gegenüber in eine Akzeptationsangst. Die daraus resultierende Symptomatik, die in den Rahmen einer chronischen reaktiven Depression gehört, wird wegen ihres komplexhaften Charakters von uns als "Akzeptationskomplex" bezeichnet. Dieser ist für den i.H. zwar sehr typisch, aber nicht spezifisch (er kann sich z.B. auch bei anderen Formen subjektiv stark empfundener Mängel entwickeln).

(7) Spezifischer scheint die andere Gruppe gemeinsamer Züge zu sein, in der eine tiefgehende Unsicherheit über die Geschlechtsrolle zum Ausdruck kommt. Sie reichen von einer Ablehnung gewisser Teilaspekte der Weiblichkeit über einzelne virile Züge bis zur "Androgynie", d.h. einer Vermischung männlicher und weiblicher Züge im Selbstbild der Pat. Eine durchgehend virile Identifikation scheint dagegen selten zu sein, ebenso gelebte Homosexualität.

(8) Die übrigen emotionellen Störungen sind weder typisch noch gar spezifisch für den i.H.. Sie gehören klinisch ins Bild der (Angstneurose, Zwangsneurose, Hysterie); seltener sind psychopathische Störungen; nur eine Pat. der Stichprobe ist als psychosenah ("Grenzfall") anzusprechen.

(9) Die meisten Pat. der Stichprobe befanden sich während des Auftretens der virilen Körperbehaarung oder in Phasen einer Zunahme derselben in einer Konfliktsituation, die in einigen Fällen sehr akut und dramatisch war. Gemeinsam war diesen Situationen, dass in ihnen die weibliche Geschlechtsrolle der Pat. irgendwie in Frage gestellt wurde. Diese Gemeinsamkeit erscheint allerdings als wenig spezifisch, da sie für die meisten Konfliktsituationen weiblicher Neurotiker gilt.

(10) Durch die Testbefunde können die klinischen Eindrücke in jedem Einzelfall gestützt werden. Eine querschnittsmässige Auswertung aller Testprotokolle ergibt darüberhinaus—unabhängig von der individuellen Diagnostik—folgende Resultate:

Die Intelligenz der Versuchsgruppe liegt im Normbereich (HAWIE; Rorschach), die Pat. sind aber emotionell gestört (MMQ; P–I–T; Rorschach), und zwar im Sinne einer neurotischen Symptomatik, in der depressive und autistische Züge vorherrschen (Rorschach; P–I–T, Kategorie F; sowie Einzelzüge aus dem MMQ und P–I–T). Der Umweltkontakt ist entsprechend reduziert (Rorschach; P–I–T: verminderte Extraversion; häufiges Fehlen der Hände in den Mensch-Zeichnungen im HTP), die Aggressivität gehemmt (P–F–T, Rorschach) und die natürliche Selbstbejahung beeinträchtigt (Rorschach). Das Selbstbild der Pat. ist häufig gestört im Sinne einer Unsicherheit der geschlechtlichen Identifikation (Rorschach und "Post-Drawing-Interview" zum HTP).

Alle Besonderheiten sind gegenüber bekannten Normwerten bzw. den aus Kontrollgruppen errechneten Werten eindrucksvoll; die Abweichungen im MMQ, P–I–T, P–F–T und den Mensch-Zeichnungen im HTP sind auch statistisch zu sichern ($p < 0{,}05$ bzw. $< 0{,}01$).

(11) Die eingangs aufgeworfenen Fragen lassen sich folgendermassen beantworten:

(a) Der H. ist für viele Pat. Ursache seelischen Leids. Es sind dies einerseits die Frauen, die die virile Stigmatisation ihres körperlichen Erscheinungsbildes nicht annehmen können, wie sie schon gewisse virile Züge ihrer Persönlichkeit abwehrten; seltener diejenigen, für die der H. in erster Linie eine narzisstische Kränkung darstellt.

(b) Psychische Störungen, die über einen reinen Leidensdruck hinausgehen, sind bei h. Frauen sehr häufig. Die meisten sind als psychisch-reaktiv aufzufassen, d.h. sie sind in ihrer Genese tiefenpsychologisch verstehbar. Gröbere konstitutionelle Störungen mit intellektueller Minderbegabung und Zeichen mangelnder seelischer Differenzierung kommen in der Regel nicht vor; ebensowenig findet man das Vollbild eines endokrinen Psychosyndroms.

(c) Eine emotionelle Auslösung des H. erscheint in einem Teil der Fälle möglich; ein sicherer Anhalt für eine Spezifität der auslösenden Konfliktstituationen wurde nicht gefunden.

(d) Gegenüber Pat. mit einem AGS bestehen neben einer Reihe von Gemeinsamkeiten auch Unterschiede. Diese hängen möglicherweise mit dem gewöhnlich früheren Beginn der Entwicklung eines AGS und dem stärkeren Grad der diesem Syndrom zugrundeliegenden endokrinen Störung zusammen.

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SUMMARY

(1) This is a report of a psychological investigation of women with so-called idiopathic hirsutism (i.hm.). It is intended to clarify the following questions:

(a) Do hirsute (h.) women often suffer from their anomaly? Which kind of women are they, and for what special reason do they suffer?

(b) Are there other psychic disturbances, and if so of what kind (constitutional anomaly, "endocrine psychosyndrome" or psycho-reactive disturbances)?

(c) Is there any reason to believe that emotional factors might play a role in the etiology of i.hm., perhaps in a specific way, e.g. in the sense of psychogenic causation?

(d) What can be concluded from a comparison with what is known of the psychological aspects of the adrenogenital syndrome (AGS).

(2) We used as the basis of our investigation the case-histories of 42 patients of our clinic. A representative sample of 15 in-patients was intensively studied by us during the course of a year.

(3) We evaluated sociological and biographical data from the total group of patients. Besides this the 15 cases of the sample were interviewed from a psychiatric and psycho-analytic point of view (M.) and tested psychologically with a battery of psychometric and projective techniques (v.Z.) during their hospitalization, which usually took several weeks. The data were—as far as possible—analysed statistically and checked for their significance.

(4) It can be shown, on the basis of the information obtained regarding the socio-economic status of the 42 cases, that within the relationship between married or widowed women to single or divorced women there is a very significant reduction of the percentage of married or widowed women in comparison with the corresponding group in the "normal" population ($p < 0{,}01$). This seems to be a sign of less intense and stable heterosexual relationships. According to the information gathered from the sample this is not due to male aversion toward hm., but on the contrary to a rejection by h. women of sexual contacts. This can be understood through the psychic situation of such women, which is elucidated by the investigation of our sample.

(5) Clinically all women of the sample are emotionally disturbed, not so much with regard to their professional efficiency, but to their personal maturation and feeling of well-being. While the personality structures of the individuals are quite different, their emotional disturbances have two trends in common.

(6) One common trend includes irritability, reduction of emotional contact, inhibition of normal exhibitionistic tendencies and autistic trends, frigidity or rejection of sexual intercourse and different symptoms of the autonomic nervous system. These reactions can be found mainly in those women who reject their hm. as an indication of masculinity, since they have not been able to integrate masculine trends within their personalities. The syndrome is not so marked in those women who—out of narcissism—regard the h. hair-growth as an aesthetic blemish.

The rejection of hm. can be extended to the personality as a whole: the patients can no longer accept themselves, or are afraid that they will not be accepted by the environment. These reactions form the picture of a chronic reactive depression. Because of their complex-like character we call them "complex of acceptance". This complex is very typical for h. women, but not specific: it can also be found in other patients in whom the self-image is impaired in different ways.

(7) The other group of common trends seems to be more specific. These trends reveal a deeply rooted insecurity concerning the sexual role of the patients. This extends from a rejection of certain aspects of the feminine role, to single masculine trends, to "androgyny", e.g. a mixture of feminine and masculine features in the self-image of the patients. Complete masculine identification and overt homosexuality, however, seem to be rare.

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(8) The other emotional disturbances are neither specific nor typical for the i.hm. Clinically they can be classified as neuroses (anxiety-neuroses, obsessive–compulsive neuroses and hysterias); there are a few cases with psychopathic disorders; one patient of our sample has to be regarded as a "borderline-case".

(9) Most of the patients of our sample were in a conflict-situation during the onset of, or increase in, the masculine hair-growth. This conflict was very acute and dramatic in several cases. In each of the situations the female role of the patients was questioned. This common feature, however, does not seem to be very specific, because it can be found in most conflict-situations of female neurotics.

(10) The clinical impressions can be proved by the findings of the test-series. Independent of the individual diagnoses, a "cross-cut-evaluation" of the test-data leads to the following conclusions: The intelligence of our sample lies within the normal range (HAWIE; Rorschach). The patients are, however, emotionally disturbed (MMQ; P-I-T; Rorschach). The disturbances form a neurotic picture with depressive and autistic features (Rorschach; PIT, category F; single "symptoms" in the MMQ and PIT). Accordingly, environmental contact is restricted (Rorschach; PIT: decreased extraversion; frequent absence of hands in the drawings of the person in the HTP), aggressiveness is inhibited (P–F–T; Rorschach) and self-acceptance is reduced (Rorschach). The self-image is often disturbed by an insecurity concerning sexual identification (Rorschach; post-drawing-interview of the HTP).

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All of these signs are impressive in comparison with known standards or with the results of control-studies. The deviations in the MMQ, PIT, P–F–T and the drawings of the person in the HTP can be proved to be statistically significant ($p < 0{\cdot}05$) or even very significant ($p < 0{\cdot}01$).

(11) Our questions (see above) can be answered as follows:

(a) Many patients suffer psychologically on account of their hm. These are mostly women who cannot accept the masculine stigmatization of their physical appearance, as they strongly reject certain masculine trends within their personalities. This is found less frequently in women for whom the hm. is mainly a narcissistic insult.

(b) Psychic disturbances surpassing mere suffering are very common amongst h. women. Most of them have to be regarded as reactive, which means that they can be understood psycho-dynamically. Constitutional anomalies with intellectual deficiency and lack of emotional differentiation are not usual. There are no typical signs of an "endocrine psycho-syndrome".

(c) In some of our cases emotional factors seem to have influenced the onset of, or the increase in the hm.; the specificity of these factors, however, is very questionable.

(d) With regard to the psychological aspects of the AGS there are similarities as well as dissimilarities. The latter might be due to the usually earlier onset of the clinical manifestation of an AGS and the pronounced intensity of the endocrine disturbance in this disease.

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OBJECTIVITY IN THE ASSESSMENT OF THE THYROTOXIC PATIENT*

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A NUMBER of investigations, based on clinical observation rather than physiological investigation, have been reported in thyrotoxic patients. MOSCHCOWITZ (1930) describes the thyrotoxic individual as sensitive, sanguine, quick, restless, over-stimulated and emotionally unstable, with bright eyes; they invariably had rapid pulses and slight tremors which increased in periods of mental strain or emotional crises. LIDZ (1949) holds that hyperthyroidism is associated with the loss or threat of loss of a cardinal interpersonal relationship. "The patients have a single important interpersonal relationship and become ill at the time of its disruption or threat of disruption, an event which confronts them with their life long fear of isolation from a protecting, mothering figure."

KLEINSCHMIDT *et al.* (1956) report a study of twenty-seven thyrotoxic patients before and after radioiodine therapy. A short multiple choice vocabulary test, the Bender-Gesalt test, a list of sixty word associations, the House–Tree–Person test, the Rorschach, and ten cards of the TAT were included in the test battery. On the basis of the responses to these intuitive and psycho-analytically oriented tests, KLEINSCHMIDT attempted to describe the personality of the thyrotoxic patient.

EYSENCK (1957), critical of the intuitive approach to the study of personality, writes: "By and large they (the psychoanalysts) appeal to intuition, clinical insight and experience in formulating their views, and reject experimental methods and statistical analysis." He considers clinical experience important in the formulation of hypotheses, but makes the point that it is an error to assume that the formulation of a hypothesis constitutes an acceptable proof for that hypothesis.

STERN (1956) using the hypothetico-deductive methods of EYSENCK, studied thirty-six hyperthyroid patients before and after therapy. She reported: "Before therapy patients were slower in speed of tapping, had longer reaction times, grossly over-estimated lapsed time, and had shorter leg-lift persistence times than after therapy; significant differences were demonstrated between the untreated hyperthyroid patients and the normal control group; and the changes in performance after therapy were all in the direction of the means of the normal control group."

Using an experimental design similar to that of STERN (1956), but with different tests, the following study was undertaken in order to obtain an objective measure of the emotional responses associated with thyrotoxicosis; to compare these findings with those of normal controls and other groups; and to observe the effect of treatment.

HYPOTHESES

(1) It is possible to assess toxicity associated with thyroid disease by objective psychological techniques.

(2) The performance of thyrotoxic patients on certain objective psychological techniques is significantly different before and after adequate therapy.

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(3) There is a significant difference between the performance on certain objective psychological techniques of normal controls, somatization reactions, obsessive–compulsive reactions, schizophrenic reactions, patients with structural and/or physiologic changes in the brain, and untreated thyrotoxic patients.

(4) There is a significant difference between the performance on objective psychological techniques of normal controls, somatization reactions, obsessive–compulsive reactions, schizophrenic reactions, patients with structural and/or physiologic changes in the brain and adequately treated thyrotoxic patients.

SUBJECTS

Ten thyrotoxic patients were studied. Nine had diffuse toxic goiter, one had nodular toxic goiter. The mean age was 42 years, with a standard deviation of 9·0 years. Seven patients were women. The patients were from the middle socio-economic strata and had completed an equivalent of a twelfth grade education. The thyrotoxic group was matched for age,* sex, socio-economic status and educational background with ten each of normal controls, somatization reactions, obsessive–compulsive reactions, schizophrenic reactions, and patients with known structural and/or functional changes in the brain.†

METHOD OF STUDY

The clinical diagnosis of thyrotoxicosis was confirmed in each instance by at least three laboratory tests: thyroid uptake and turnover of ^{131}I serum chemical protein bound iodine, *in vitro* erythrocyte uptake of ^{131}I labelled I-tri-iodothyronine, ^{131}PBI conversion ratio, and basal metabolic rate. The patients in this study were otherwise unselected. The psychological tests were administered before treatment and during the response to treatment.

Thirty sets of observations were made on ten patients in the internist's office and delivered for scoring to the consulting psychologist, who knew nothing about the patient, other than age and sex. The psychologist and internist independently rated the subjects as to toxicity. The clinical classification ratings were correlated with the ratings based on the psychological examination, using Pearson's *r*.

TESTS

Objective psychological tests, which differentiate between normal controls, somatization reactions, obsessive–compulsive reactions, schizophrenic reactions, and patients with known structural and/or physiologic changes in the brain, provide an external criterion for classification. The psychological battery is made up of three tests: the first and second assess neuroticism, as defined by EYSENCK (1957); the third discriminates between normals and psychotics and between normals and patients with brain disease.

1. *Maudsley medical questionnaire*

The Maudsley medical questionnaire, modified for the American population, is a forty-item neuroticism inventory, constructed through a series of item analyses and validation experiments. It has been found to correlate highly with psychiatric opinion on neurotics and normals. The score is the number of 'yes' answers (*C*), e.g. 'do you get palpitations or thumping of your heart?' and 'do you sweat a great deal without exercise?'

2. *Crown word connection list*

The Crown word connection list, modified for the American population, is a controlled association test in which each item consists of a stimulus word and two possible response words, one of which is an 'abnormal' response, the other a 'normal' response. The score is the number of abnormal responses, (*N*) e.g. SINK: wash, drown.

* It was impossible to match one patient, 72 years of age, with a schizophrenic.

† Three patients with avitaminosis, three patients with cerebral arteriosclerosis, three patients with post-traumatic encephalopathy, and one patient recovered from a cerebro-vascular accident.

3. *Colour naming stress test*

This is a visual technique, evaluating the ability to hold two concepts in consciousness, simultaneously. Names of colours are printed in coloured inks, not, however, in the colour represented by the written word, e.g. the word BLUE may be printed in red ink. The subject is asked to call the colour of the ink, disregarding what the word spells. Three scores are derived: the time, in seconds, required to call off the colour of the ink (*S* score); the errors in performance (*E* score); and the level of aspiration (*A* score), where the subject is advised of his *S* score and asked to estimate the number of seconds it would take him to do the task again.

The tests making up the psychological examination appear to be uncorrelated, measuring independent dimensions of the personality. The intercorrelations of the several tests are shown in Table 1. The test–retest reliability (Pearson's *r*) for one hundred normal controls are shown in Table 2.

TABLE 1

	C	*N*	*S*	*E*
C	1·00			
N	0·08			
S	0·03	0·10		
E	0·10	0·02	0·06	
A	0·08	0·23	0·16	0·11

TABLE 2

Test	*r*
C	0·73
N	0·68
S	0·78
E	0·72
A	0·69

FINDINGS

The null hypothesis that the clinical and psychological assessment of toxicity agrees to an extent no greater than chance was tested in thirty instances by calculating the coefficient of correlation and was rejected (*r* was calculated to be 0·56, significant at the one per cent level). Therefore, there is an association between the two assessments of toxicity. From this association, it may be argued that it is possible to assess toxicity by certain objective psychological techniques.

The null hypothesis that any agreement between the performance on objective psychological techniques, before and after adequate teatment, is no better than chance, was tested by calculating *t*, and was rejected. The *t* values are shown in Table 3. It is therefore argued that the performance of thyrotoxic patients before and after adequate therapy is significantly different.

The qualitative assessment of the Maudsley medical questionnaire reveals that thyrotoxic patients tend to worry about humiliating experiences, are troubled with feelings of inferiority and self-consciousness. They complain of palpitations of the

heart, shortness of breath and sweating with minimal exercise, headache, sleep disturbance, nervousness, irritability and depression. With the exception of disturbance of mood, these complaints are abolished by treatment.

The qualitative assessment of the psychological examination reveals the thyrotoxic patient, prior to treatment, to be emotionally labile. When he must consider more

TABLE 3

Tests	Before adequate therapy	After adequate therapy	t	p
C	15·5	9·6	8·78	0·001
N	7·6	6·0	2·40	0·05
S	2·4	1·9	4·51	0·01
E	6·7	1·8	4·05	0·01
A	1·30	1·14	3·12	0·05

TABLE 4

Tests	Thyrotoxics	Normal controls	t	p
C	15·5	2·9	4·54	0·001
N	7·6	3·8	2·56	0·05
S	2·4	1·8	3·19	0·01
E	4·7	1·1	2·58	0·05
A	1·30	1·15	1·69	n.s.

TABLE 5

Tests	Thyrotoxics	Somatization	t	p
C	15·5	16·9	0·42	n.s.
N	7·6	4·5	0·54	n.s.
S	2·4	2·0	0·62	n.s.
E	4·7	2·1	2·22	0·05
A	1·30	1·06	2·64	0·05

than one thing at a time his problem-solving time increases and he makes errors. He tends to set goals for himself which are unrealistic. He tends to internalize his conflicts and frustrations.

The null hypothesis that the performance of untreated thyrotoxic patients did not differ, significantly, from the performance of normal controls, somatization, obsessive–compulsive, schizophrenic reactions and patients with known structural and /or physiologic changes in the brain, was tested by calculating t, using the formula for independent means. The t values are shown in Tables 4–8.

It is likely that untreated thyrotoxic patients come from a different universe of patients than normal controls, somatization, obsessive–compulsive, and probably schizophrenic reactions. In the case of the patients with structural changes, the null hypothesis was accepted.

The null hypothesis that the performance of adequately treated thyrotoxic patients did not differ, significantly, from the performance of normal controls, somatization,

TABLE 6

Tests	Thyrotoxics	Obsessive–compulsive	*t*	*p*
C	15·5	22·1	2·15	0·05
N	7·6	8·7	0·54	n.s.
S	2·4	1·9	2·64	0·05
E	4·7	2·1	2·11	0·05
A	1·30	1·09	2·11	0·05

TABLE 7

Tests	Thyrotoxics	Schizophrenics	*t*	*p*
C	15·5	23·5	2·42	0·05
N	7·6	13·1	2·10	0·05
S	2·4	2·5	0·32	n.s.
E	4·7	3·1	1·08	n.s.
A	1·30	1·47	1·29	n.s.

TABLE 8

Tests	Thyrotoxics	Structural change in brain	*t*	*p*
C	15·5	17·7	0·57	n.s.
N	7·6	10·7	1·05	n.s.
S	2·4	2·7	0·92	n.s.
E	4·7	6·5	1·05	n.s.
A	1·30	1·26	0·38	n.s.

obsessive–compulsive, schizophrenic reactions and patients with known structural and/or physiologic changes in the brain, was tested by calculating *t*, using the formula of independent means. The *t*-values are shown in Tables 9–13.

It is likely that adequately treated thyrotoxic patients come from a different universe of patients than schizophrenic reactions and patients with known structural and/or physiologic changes in the brain. In the case of normal controls, somatization and obsessive–compulsive reactions the null hypothesis was accepted.

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TABLE 9

Tests	Post treatment thyrotoxics	Normal controls	*t*	*p*
C	9·6	2·9	3·31	0·01
N	6·0	3·8	1·37	n.s.
S	1·9	1·8	1·14	n.s.
E	1·8	1·1	0·82	n.s.
A	1·14	1·15	0·13	n.s.

TABLE 10

Tests	Post treatment thyrotoxics	Somatization	*t*	*p*
C	9·6	16·9	2·65	0·05
N	6·0	4·5	0·97	n.s.
S	1·9	2·0	0·63	n.s.
E	1·8	2·1	0·34	n.s.
A	1·14	1·06	0·78	n.s.

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TABLE 11

Tests	Post treatment thyrotoxics	Obsessive–compulsive	*t*	*p*
C	9·6	22·1	5·11	0·01
N	6·0	8·7	1·54	n.s.
S	1·9	1·9	0·34	n.s.
E	1·8	2·1	0·32	n.s.
A	1·14	1·09	0·61	n.s.

TABLE 12

Tests	Post treatment thyrotoxics	Schizophrenics	*t*	*p*
C	9·6	23·5	5·15	0·001
N	6·0	13·1	2·74	0·05
S	1·9	2·5	2·54	0·05
E	1·8	3·1	1·30	n.s.
A	1·14	1·47	2·74	0·05

TABLE 13

Tests	Post treatment thyrotoxics	Structural change in brain	t	p
C	9·6	17·6	2·44	0·05
N	6·0	10·7	1·70	n.s.
S	1·9	2·7	2·70	0·05
E	1·8	6·5	3·61	0·01
A	1·14	1·26	1·31	n.s.

CONCLUSIONS

(1) It appears likely from the findings that there is no significant difference between the performance on certain objective psychological techniques of untreated thyrotoxic patients and patients with known structural and/or physiologic changes in the brain, and that thyrotoxicosis is a metabolic disease manifested by impaired psychobiological integration, involving particularly the autonomic nervous system.

(2) It appears likely from the findings that there is no significant difference between the performance on certain objective psychological techniques of normal controls, somatization reactions, obsessive–compulsives and adequately treated thyrotoxic patients, and that the adequately treated thyrotoxic patient closely resembles the essentially normal individual who tends, under stress, to internalize his conflicts and frustrations. When the performance of the treated thyrotoxic patient is fitted to the normal curve, derived from the population on which the tests were standarized, the treated patients fall within normal limits.

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SUMMARY

The role of the personality in thyrotoxicosis has been stressed, and psychodynamic studies have indicated that frustration of dependent needs is the predisposing factor in the onset of the disease. Our observations suggest that the role of the personality in thyrotoxicosis may have been over-stressed. A newer understanding of the probable physiological and biochemical basis for mental diseases, and the availability of objective, psychological techniques, already proven to separate various emotional states, led us to obtain an objective measurement of the emotional responses associated with thyrotoxicosis, to compare those findings with those of normals and other groups, and to observe the effect of treatment. The tests used discriminate between the factors of neuroticism and psychoticism; they also identify structural and/or physiologic changes in the nervous system associated with ageing, disease and trauma. It is believed that this approach offers a decided advantage over the usual psychiatric interview and psychoanalytically oriented psychological tests. A description of the techniques used and an analysis of the data obtained is presented, which lead us to the following conclusions:

(1) The presence and degree of toxicity can be assessed by objective, psychological techniques.

(2) There is a definite relationship between the clinical and psychological assessment of toxicity: r was calculated to be $+0{\cdot}56$, significant at the 1 per cent level.

(3) The performance on objective, psychological techniques of untreated thyrotoxic patients is significantly different from that of normal controls, somatization reactions, obsessive–compulsives and schizophrenics, but strongly similar to that of patients with organic, structural changes in the brain.

(4) There is no significant difference between the performance of adequately treated thyrotoxic patients and normal controls, somatization reactions and obsessive–compulsives.

(5) Thyrotoxicosis is a metabolic disease manifested by impaired psychobiological integration, involving particularly the autonomic nervous system. The adequately treated thyrotoxic patient closely resembles the essentially normal individual, who tends, under stress, to internalize his conflicts and frustrations.

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J. Psychosomatic Res., 1960, Vol. 4, pp. 244 to 250. Pergamon Press Ltd., London Printed in Northern Ireland

BOOK REVIEWS

F. ANTONELLI: **Il Reumatismo Psicosomatico.** Soc. Editrice Universo, Rome, 1957. 210 pp.

IN THIS handsomely produced volume, Professor ANTONELLI sets out to review in the light of his very extensive experience many old and some new problems relating to the psychosomatic study of the rheumatic diseases, especially rheumatoid arthritis.

Beginning with the concept that neurosis is a disturbance of personality, and after discussing how this accords with the many current definitions of neurosis and of psychosomatic disorders, Professor ANTONELLI goes on to expound the view that there exists a specific "rheumatic neurosis", the outcome of intrapsychic conflict or environmental stress upon a special, well-defined personality type. This typical neurosis is usually associated with somatic changes which approximate more and more to the characteristic syndrome of rheumatoid arthritis as the illness develops. Occasionally, however, and particularly in the earlier stages of the disease, the neurotic picture does not include somatic components. On the other hand, marked organic changes are always accompanied by neurotic manifestations, though the latter may not be evident at first sight.

The specific personality type found in individuals predisposed to rheumatic neurosis is given in some detail, and is distinguished from that associated with ankylosing spondylitis. Such individuals are thought to be particularly vulnerable to certain forms of stress, and these too are minutely considered. The transition from mental conflict to physical change is believed to represent firstly, a failure of psychic defence mechanisms, and secondly, the participation of the autonomic system consequent upon the primary mental disturbance. Hence the localization of the various lesions is always of symbolic significance.

These concepts lead on the view that the arthritic and other manifestations of the disease act as a safety valve for psychic tension, which is illustrated by discussion of those cases in which exacerbations of the rheumatoid changes and psychosis have alternated.

On the organic side, Professor ANTONELLI describes in detail the role of metabolic, hepatic, hormonal and autonomic factors, and discusses the anomalies which may be detected on laboratory investigation in these and other systems.

Finally, after considering a system of classification based on the above aetiological concepts, the author proceeds to the question of therapy. He is emphatic in asserting that psychotherapy must constitute the first line of treatment, though sleep therapy, tranquillizing and sedative drugs, analgesics and physiotherapy all receive appraisal as valued auxiliary agents. The book concludes with a valuable bibliography of over two hundred references.

Professor ANTONELLI is to be congratulated on having produced a stimulating and thoughtful volume which will help many to clarify the numerous obscurities in this difficult field of study.

N. KREITMAN

F. LEURET and H. BON: **Modern Miraculous Cures.** Peter Davies, London, 1957. 16s.

OF ALL the alleged cures at Lourdes, an average of about one per year is declared miraculous by the Church authorities after prolonged deliberation. Medical details of some of these are given in this enthusiastic account by two Catholic doctors, both passionate believers in the miracles.

The medical reader will be struck first of all by the enormous gaps in the evidence as to diagnosis. One might have charitably assumed that more facts were available than could be summarized in a popular book, but having seen the complete dossiers at Lourdes one realized the scantiness of the

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original evidence, and the thoroughness with which the authors have assembled all the facts that fit their views. Some of the examples which the writers quote with reverence and wonder to the outsider seem nothing out of the ordinary. Mlle. Clauzel, for instance, suffered from spinal osteoarthritis. She also had a plethora of symptoms suggestive of functional disorder—myoclonic attacks, a large variety of fluctuating pains, an absence of neurological signs, and a history of psychological methods of treatment. After taking to her bed and refusing food for a long time she got very weak and was thought likely to die. At her own request she was carried to Mass. In church she suddenly felt better, got up, walked home, ate heartily, and rapidly regained health and strength. Though this point is omitted in the book, her X-rays continued to show the same arthritic signs, but she remained symptom-free.

Another lady, Mme. Rose Martin, made a sudden recovery from what was supposed to have been a secondary carcinoma. It manifested by a lump felt on one occasion P.R. some months after a hysterectomy for adeno-carcinoma of the cervix. She was severely constipated from heavy addiction to morphine, and there was evidence of pelvic infection, but other explanations of the lump are brushed aside.

If the book fails to satisfy a miracle hunter of moderate scepticism, at least it makes some points clear, although not the ones emphasized by the authors. For instance, one now knows that the Lourdes records do not contain cases of sudden changes in X-ray appearances or in pathological findings. The miracles, such as they are, concern sudden recovery from chronic, debilitating conditions of questionable origin. Considering the many thousands who visit Lourdes annually, and the many more who pray from a distance, some at least of these recoveries must be purely coincidental.

These expressions of scepticism are not meant to imply that psychosomatic changes of extraordinary interest do not sometimes take place at Lourdes and other healing shrines. Some examples of extremely rapid healing of chronic abscesses are particularly interesting. But this book is not the source to recommend for studying such matters.

D. J. West

Child and Juvenile Delinquency. Symposia on Juvenile Delinquency, presented at the American Orthopsychiatric Association. B. Karpman, Chairman and Editor. Psychodynamic Monograph Series. Washington, D.C., 1959. 385 pp. $10.00

Five yearly symposia (1949-1953) on juvenile delinquency are contained within this book. They include formal papers and discussions by over thirty contributors, most of them psychiatrists. Dr. Karpman deserves special credit for organizing these and other symposia on delinquency, for his valiant efforts in summarizing and contrasting the different viewpoints presented in each symposium, pointing out neglected areas of investigation, in trying to tie all the loose knots together and weaving a cover-all pattern. For all his efforts the book remains a rather loose and repetitious assemblage, which in its present form requires much unnecessary reading to find the kernels of wisdom that it undoubtedly contains. Dr. Karpman might well have employed his time in giving the reader an organized and critical account of these proceedings, a task he is well qualified to perform. However there are, no doubt, a number of specialists in the field and probably others also who prefer the full unabridged account.

The various psychiatric approaches to the field are well represented, with a few exceptions. The viewpoints of psychiatrists who have stressed factors of inheritance, neuropathology, somatotypes and educational handicaps are represented in a sketchy way. The endocrinologic account contains two case studies in which the injection of androgen hormone had markedly beneficial effects on body build and personality growth. Delinquencies were also no longer in evidence. Throughout the symposium stress was placed on an eclectic approach, though as usual there was a natural bias in the direction of each clinician's special field of competence. Most of the discussants were concerned with psychodynamics. The traditional psychoanalytic approach was represented by one discussant. Ideas derived from psychoanalysis were apparent throughout the symposium. A particular topic that gives this symposium its special feature was emotional privation, by which was meant the absence or lack of maternal love and other forms of maternal psychological sustenance in early life. Why various deficits, emotional traumata, and conflicts finally emerged in the form of delinquency, rather than neurosis, etc., involved consideration of sociological factors ("disruptive environments") besides

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the intensity and frequency of the particular individual pathogenic experiences. The vulnerability of the individual at particular developmental stages was given new emphasis. In regard to methods of treatment, a specially cogent point was made of the basic need for a responsible and enduring relationship of the patient with a parental person, a real parent or a social worker in a foster-care agency. Otherwise the therapist's efforts must be in vain. Techniques of therapy and institutional practise were not among the topics selected.

All in all, this symposium places the major and almost exclusive stress on the child's experience within his family as the primary cause of delinquent behaviour.

DAVID M. LEVY

D. H. STOTT: **The Social Adjustment of Children.** University of London Press, London, 1958. 46 pp., 25s.

THIS book is intended as a manual for use with "The Bristol Social Adjustment Guides" but includes stimulating discussions of methodology in psychological research and the theoretical implications of Dr. STOTT's findings. The term "social adjustment" is somewhat misleading in that the Guides do not provide developmental norms of social development as does, for example, "The Vineland Social Maturity Scale" (DOLL*). They are designed specifically to assess and describe manifestations of emotional maladjustment and disorders of behaviour. Of existing techniques, they appear most closely related to "The Fels Child Behaviour Scales" (RICHARDS and SIMONS†) or similar behaviour rating scales.

Three forms of the Guides are provided, designed for the assessment of children's behaviour in school, in residential care and in family situations. Teachers, social workers or other appropriate reporters complete the record forms by underlining phrases which best describe the child's recent behaviour or attitudes in various situations. For example, in "Guide BG1: The Child in School (Boy)", one group of items refers to "belongings" and includes the following phrases: Looks after books, etc./careless, untidy; often loses or forgets books, pen/destructive, defaces with scribbling. Through successive trial editions such items were progressively modified so as to maximize the differentiation between groups of "maladjusted" and "normal" children. Although the method is essentially that of the rating scale, Dr. STOTT and his co-workers have taken great care to reduce inference to a minimum and to make the items, as nearly as possible, unambiguous reports on "bits of behaviour" or universally accepted interpretations of emotional expression. In this way they have been relatively successful and evidence is presented of high reliability of report in terms of agreement between different observers. Large scale reliability trials have yet to be completed.

Although the number of adverse scores is considered to be an approximate measure of degree of maladjustment, the Guides are not treated as unidimensional scales. The underlined items indicative of maladjustment are, with the aid of transparent templates, rearranged into groups representing attitudes or behavioural syndromes such as "withdrawal", "depression", "hostility to adults", etc. This classification derives from an analysis of the relationships between items. All scores obtained during validation studies were entered on a chart as check marks in a matrix in which the rows represented items and the columns subjects. This matrix was submitted to a form of visual cluster analysis which is claimed to have advantages over more orthodox statistical procedures. Many will consider this claim unjustified and, from the description of the procedure, it is difficult to judge the extent to which the final classification depends on Dr. STOTT's theoretical views which, he admits, were taken into consideration. The manual would be improved by the inclusion of the original matrix thus allowing alternative analyses and classifications by other workers.

Many psychologists will disagree with Dr. STOTT about several of the theoretical issues discussed in this book. Few will deny that the Bristol Guides provide valuable tools for the assessment of maladjustment in children, both for routine clinical purposes and for research.

H. GWYNNE JONES

* DOLL E. A. (1953) *Measurement of Social Competence.* Educational Test Bureau, New York.
† RICHARDS T. W., and SIMONS M. P. (1941) The Fels Child Behaviour Scales. *Genet. Psychol. Mon.* **24**, 259.

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GÜNTER CLAUSER: **Klinische Psychotherapie Innerer Krankheiten (Clinical Psychotherapy of Internal Diseases).** Springer, Berlin, Göttingen, Heidelberg, 1959. 69 pp.

IN May 1958 the teaching hospital of the University of Freiburg celebrated the opening of the first independent psychotherapeutic unit which was specially designed for the treatment of psychosomatic disorders but excluded psychoses and psychopaths. The papers read on that occasion are published in this symposium.

J. H. SCHULTZ and H. GÖPPERT contributed general surveys of psychotherapeutic methods. The subsequent four papers dealt more specifically with the psychotherapeutic needs of the new unit. An obstinate form of constipation was described which occurred chiefly in young women between the ages of 18 to 24. Twenty such cases were observed and an account was given of the cure of three of them. They improved dramatically when they were led to the disturbing conclusion that an analogy existed between the holding back of dirty faeces and the holding back of dirty secrets. One wonders what happened to the other seventeen patients.

The director of the new unit, G. CLAUSER, regarded it as his primary duty to make clinical psychology palatable to the general physicians. He attacked the prejudice which ridiculed psychiatrists as story-tellers who deal with sexual troubles and with the imaginary symptoms of the unintelligent. He accused general physicians of misjudging psychosomatic disorders when they had recourse to such doubtful diagnoses as latent tetany, larval myxoedema, masked hyperthyroidism, and so on. He outlined the programme of the new unit which consisted in interviews to gain the confidence of the patients and attempts to show them that they are not second-rate patients; that their symptoms are not imaginary; that they are partly responsible for their symptoms; and that they have to take an active part in the life of the unit, in individual and group discussions, psychodrama, and physical and educational training methods.

F. KRÄUPL TAYLOR

Selected Writings of John Hughlings Jackson. Edited by J. TAYLOR. Staples Press, London, 1959. Vol. I, xiv + 500 pp; Vol. II, viii + 510 pp; £6. 6s.

THESE two volumes have been out of print for over 20 years. The original edition attained a rarity value which makes this publication by the Staples Press an event of significance for the present generation of neurologists and psychiatrists. For HUGHLINGS JACKSON'S writings are not easily assimilated, nor to be read as it were, in one fell swoop, on a library subscription. Like so many nineteenth century works, they are meant to be browsed upon, the contents suggestive, evocative of new ideas when taken at a pace which allows of contemplation. The first duty of a reviewer is already done—the writings are already a classic, and the Staples Press are to be congratulated on republishing these two volumes, handsomely printed and bound, and by no means expensive.

So much has been written of HUGHLINGS JACKSON that he is now practically sanctified—which would probably greatly amuse him. But fulsome praise and the banal repetition of his ideas sometimes produces a feeling of nausea. He must be seen in a historical perspective—after all, neurology and psychiatry have advanced greatly in the last 50 years. JACKSON was in the line of the great nineteenth century clinicians, fertile in general ideas derived from clinical practice. As with his contemporary, FREUD, these ideas have remained to stimulate future generations, but we must beware lest a slavish respect does not stultify our own originality. As JACKSON writes: "We have multitudes of facts, but we require, as they accumulate, organizations of them into higher knowledge; we require generalizations and working hypotheses". These latter he attempted to provide—it was left for the future to test them out.

To readers of this journal the inference is clear, for this is the purpose of our work, the testing out and validation of ideas, and the development of further generalizations. HUGHLINGS JACKSON'S work is still a living thing, and these two volumes make it once again easily available.

DENIS LEIGH

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V. NORRIS: **Mental Illness in London.** Maudsley Monograph, No. 6. Chapman & Hall, London, 1959. 317 pp., 35s.

THIS monumental posthumous work is a survey of the populations admitted to certain observation units and mental hospitals in the London area during the period 1947–1949. Two observation units and three mental hospitals were selected; the patients admitted during the selected period were followed up until 31 December 1951. The extent of the work can be judged from the fact that 11,000 case papers were examined and thirty different items were recorded for analysis on each.

What emerges from this enormous work is perhaps a little disappointing. The expectation of mental illness—much worked upon in Scandinavia—is shown to be high, and the survey confirms what we already know about the comparative incidence of the different categories of psychosis. The prognosis of all mental disorders severe enough to require mental hospital treatment is shown to be poor. The work is impeccably done and the findings will be useful as a baseline for comparing the situation in 1947–1949 with what is obtained later. The trouble is that these years are already regarded almost as the "bad old days": there has been a great upsurge in psychiatry. New drugs, new psychiatrists, new ideas of treatment and of the social handling of patients may make this study no more than an academic exercise. This attitude, of course, is just the one which Dr. VERA NORRIS has sought to demolish by her impeccable survey—it would need more evidence than she puts forward to do so in 1959.

The book is beautifully produced. Professor AUBREY LEWIS's usual modest editorial foreword cannot hide the immense part he has played in bringing the book to press—nor indeed in bringing about the success of the whole series. The price alone makes the book a bargain.

DENIS LEIGH

J. M. JAMAR: **International Textbook of Allergy.** Blackwell Scientific Publications, Oxford, 1959. 639 pp., £5. 10s. 0d.

ALLERGISTS are almost as prolific writers as psychiatrists, and there tend to be too many symposia published that repeat the same reviews of the literature, the same experiments, and the same views. This textbook, however, provides an extremely useful addition to the literature. It takes the form of a series of thirty-one articles by different authors, each dealing with a particular aspect of allergy. The chapter by STOKVIS on the "Psychosomatic aspects and psychotherapy in allergic diseases" is particularly valuable, for a fairly comprehensive bibliography of 296 items is given, together with a most useful review of the literature. Similarly excellent, but in a different way, is the chapter by OSTFELD and WOLFF on "vascular headache of the migraine type". D. A. WILLIAMS' chapter, as one has come to expect from this worker, is the best of its kind, and provides information not easily obtainable elsewhere.

For all working in the field this book will provide an excellent source of reference. It can be thoroughly recommended.

DENIS LEIGH

JOHN MARSHALL: **Clinical Neurophysiology.** Blackwell Scientific Publications, Oxford, 1959 296 pp., 36s. 6d.

WERE this book being reviewed in a Neurological Journal there would be little need to recommend it: classical neurology has always kept in touch with its basic sciences of anatomy and physiology. A volume such as this coming, as it were, from the Delphic oracle itself will be its own recommendation to the neurologist. This is not to imply, however, that psychiatry has lost touch with its basic sciences. It is only because attempts to establish the relationship between nerve-cell function and psychological process has up to the present presented such formidable difficulties that the problem has for preference been tackled from other directions—such as normal and abnormal psychology, sociology and so on.

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However, it is just because we now at last begin to be able to understand psychological concepts in neuro-physiological terms—consciousness in terms of the reticular substance, for example—that this book comes at an opportune moment for the psychiatrist. The study of synaptic physiology, of electroencephalography, and the function of the so-called "silent areas" of the cortex are the ways along which the psychiatrist can bring himself more into contact with clinical neurology and into contact with rapidly developing fields such as biochemistry and pharmacology.

This book is of value because it gives a very up to date and lucid survey of the above-mentioned topics. Its appeal to the psychiatrist is not as immediate as it might be only because it is a book primarily intended for the neurologist; and this orientation is well illustrated by the following quotation from the chapter entitled "Reflex and Synapse", p. 103:

"There is a great field for exploration into the action of pharmacological substance on synaptic transmission, which might give rise to therapeutic clues in the management of such problems as spasticity".

For the word "spasticity" could very well be substituted "major psychoses" responsible for the chronic hospitalization of some 80,000 or 90,000 patients. Equally as important as facts is the framework with which we reflect upon them, and to reflect in a neuro-physiological framework set out as clearly as it is in this book will be productive of ideas fruitful for psychiatric research.

A most valuable feature of the book is a bibliography of over 500 references, some as recent as 1957.

J. P. Dewsbery

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ANNOUNCEMENT

THE First Congress of Psychosomatic Medicine, (de langue française) will be held at Vittel (Vosges) from the 8th to 10th July 1960, under the presidency of Professor JEAN DELAY.

The programme includes the following topics:—

1. Practical and theoretical aspects of Psychosomatic Medicine. (President: J. DE AJURIAGUERRA, Geneva.)
   Dr. CH. BRISSET will introduce this session with a report on work in progress. This will be followed by various papers and a Round Table Conference.
2. Relaxation. (President: Professor J. H. SCHULTZ, Berlin)
   Congress Secretary: Professor AGR. PIERRE ABOULKER.
   Scientific Secretaries: Dr. L. CHERTOK.
   Dr. M. SAPIR.

For information please write to:

The French Society of Psychosomatic Medicine,
54 Avenue de la Republique,
Villejuif (Seine).

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PHYSIOLOGICAL EFFECTS OF "SOCIAL STRESS" IN WILD RATS—II

LIVER GLYCOGEN AND BLOOD GLUCOSE

S. A. BARNETT,* J. C. EATON†, and H. MORAG MCCALLUM‡

(*Received* 2 *November* 1959)

INTRODUCTION

WHEN adult male wild rats (*Rattus norvegicus* Berkenhout) come into conflict, some die without being wounded (BARNETT, 1958a,b). In the work quoted this lethal fighting was studied experimentally in two types of situation. First, it occurred in colonies of adult males and females, strangers before being put together in a large cage or an enclosure: in these conditions deaths were spread over a period of weeks, and were usually the result of conflict of low intensity. Secondly, if an adult male was put in a colony in which one or more adult males were already established, the newcomer was attacked and often died within a few hours. This type of severe conflict has not been found among tame, laboratory rats placed in identical situations (BARNETT, 1960).

Male wild rats living in the first, prolonged type of conflict situation have enlarged adrenal glands; the second, acute type of conflict may also be accompanied, in animals that have been attacked, by a gross depletion of the sudanophil material (cholesterol) of the adrenal cortex: that is, a hormone precursor. These two effects are also characteristic results of "stress" such as exposure to cold or wounding. The term "social stress" has therefore been used to name the situation in which relations between individuals of the same species have this sort of effect (BARNETT, 1958b). We show below that death in these conditions is not associated with any morbid condition evident from routine pathological examination.

Death of obscure origin has been reported in other mammals. In some species a fairly regular 4-year or 10-year population cycle occurs: this has been reviewed by ELTON (1942). The population in a given area rises gradually to a peak and there is then a sudden decline or "crash". Fighting often occurs in these populations, and there is evidence that the intensity of conflict increases with population density (reviewed by CHITTY, 1957). GREEN, LARSON and BELL (1939), working on the snowshoe hare (*Lepus americanus*), and FRANK (1953), working on a vole (*Microtus arvalis*), have reported that the occurrence of sudden unexplained death is accompanied by decreased liver glycogen and hypoglycaemia. There are also changes in the adrenal and thyroid glands. It was not possible, in either species, to attribute this extensive physiological upset to a pathological condition of any organ. CHRISTIAN (1950), reviewing observations of this kind, compared the state of these mammals to the exhaustion phase of Selye's general adaption syndrome.

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† Department of Biochemistry, Royal Infirmary, Glasgow, and
‡ Department of Pathology, Western Infirmary, Glasgow.

In this paper we give evidence that hypoglycaemia is not a factor in the death of "socially stressed" wild rats. We also discuss, in the light of this and other findings, the nature of the problem presented by death resulting from social stress. The word "stress" is used below, unqualified, when we wish to refer to agencies such as cold, wounding and others which bring about autonomic excitation and increased adrenocortical activity.

RATS AND METHODS

The rats used in the main experiments were adult males bred in the laboratory; the stock was derived from wild rats (*Rattus norvegicus*) trapped in Glasgow. Each rat was weighed at the beginning and end of the experiment. The methods used in dealing with these animals have been fully described elsewhere (BARNETT, 1958c).

The rats were studied in one of three types of situation (Table 1): (1) Some were left in small cages, each alone with one female; these were not subjected to any kind of competition with other rats, and constituted the control group. They were litter mates of rats used for the experiments. (2) Three

TABLE 1.—THE RATS USED

	Total no. of rats*	Weight range, g†
Acutely stressed (fasted)	14	205–360
Acutely stressed (not fasted)	11	250–450
Colony members (3 colonies)	15	175–370
Controls (fasted)	10	170–300
Controls (not fasted)	18	215–330

* Not every rat was used for both liver glycogen and blood sugar: see Table 2.
† At beginning of experiment.

colonies were set up, each containing the same number of males and females: the males were initially strangers to each other and to the large cage in which they were placed. The cage had five nest boxes in which the rats could shelter. Two colonies consisted of 8 rats each, and these were kept going for 14 days; the third was of 14 rats, and this was maintained for 8 weeks. There was no evidence of a difference in liver glycogen or blood sugar between the rats of the first two colonies and those of the third; the data from the 15 males of these colonies have therefore been treated together. In any case it is not possible to standardize the conditions in such colonies: the rats are genetically heterogeneous and their individual behaviour is very diverse (BARNETT, 1958a). (3) 26 rats were acutely "stressed" by being put in a large cage in which another male was already established. Six of these died, and could not be used for estimation of blood sugar or liver glycogen. Again it was impossible to standardize the "stress" involved. Even if the same resident male had been used throughout, the intensity of the attacks would have increased on successive occasions, since residents in these conditions became steadily more ferocious. (3a) The rats of one group treated in this way were not fasted before the experiment and were exposed, one at a time, to attack for 24 hr. (3b) A second group of these rats were fasted for 24 hours before the experiment began. They were each put in a cage containing a particularly fierce resident male and, in order to reduce the intensity of the attacks, were exposed in pairs; the duration of exposure to attack was kept to 5 hr for this group. These rats did not eat during this period, and so their liver glycogen and blood sugar were estimated after 29 hr of fasting. Some of the control rats too were fasted for 29 hr, but none of the colony members.

Rats were killed by a blow on the head in such a way that blood flowed from the nose. After the first two or three drops had been allowed to escape the blood was collected in a tube containing sodium fluoride, and was used for estimation of blood glucose. This method of collecting blood was used because it was found that wild rats, unlike laboratory rats, do not bleed readily from the cut tail.

As soon as the bleeding stopped the rat was opened in the mid-ventral line and the ventral lobe of the liver quickly removed. Glycogen was estimated by the method of TREVELYAN and HARRISON

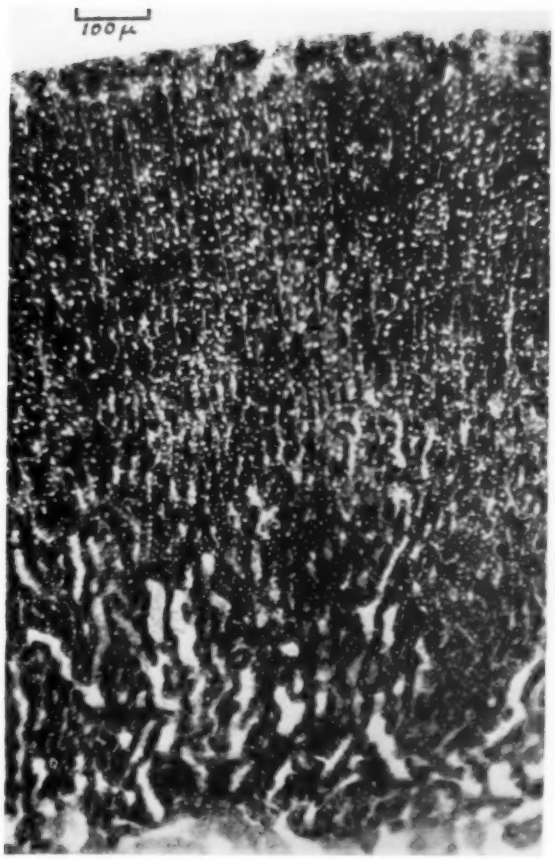

FIG. 1.—(a) Section of the right adrenal gland of a control rat; sudan black. The cortex is heavily stained. The blood glucose of this rat was 84 mg/100 ml.

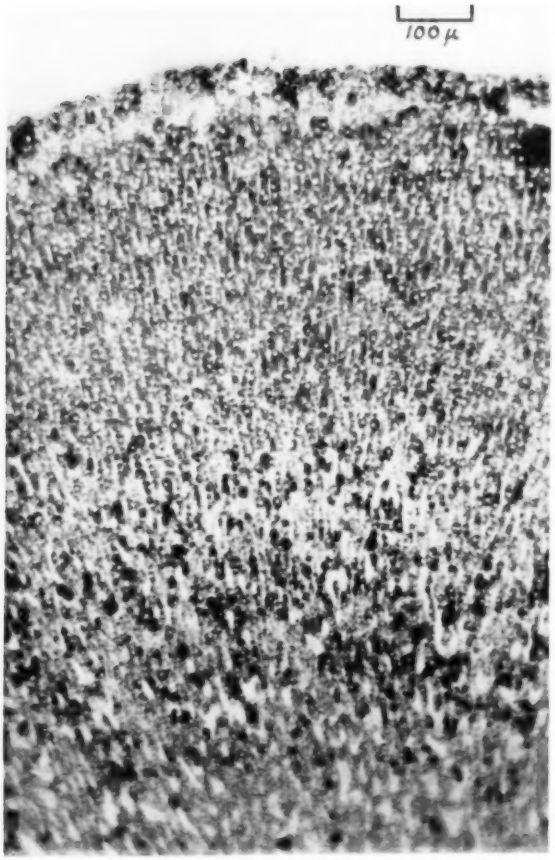

FIG. 1.—(b) Section of the right adrenal of a rat subjected to attack for 5 hr. after 24 hr fasting; sudan black. The cortex is lightly stained, showing severe depletion of cholesterol. The blood glucose of this rat was 149 mg/100 ml.

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(1952), in which the anthrone reagent is used. The adrenals were removed, and in some instances dealt with in the manner described by BARNETT (1958b). Lungs, liver, kidneys, spleen and intestines were also removed from some rats and placed at once in formalin for later pathological examination. Some of the rats examined in this way belonged to a hybrid stock derived from a wild × albino cross (BARNETT, 1960).

RESULTS

Adrenal Glands

In a previous paper (BARNETT, 1958b) the adrenal glands were shown to provide an index of the degree of stress to which rats in these conditions are subjected. Observations were therefore made on the adrenals of some of the acutely stressed rats (group 3) of the experiments here described. Of 5 rats which had not fasted and which were subjected to attack for 24 hr, 4 had adrenals which showed histochemical evidence of depletion of the cortex (Fig. 1). Of 13 fasted rats, subjected to attack for only 5 hr, 5 had depleted adrenals. It is of interest that in some rats this effect was evident in so short a time; but the main importance of these observations is that the acutely stressed rats of these experiments were shown to be in a state similar to that of the rats used in the experiments previously reported.

Liver Glycogen

Table 2 summarizes the results of the estimations of liver glycogen. All the experimental procedures led to a lowering of the glycogen level. The colony members (which were not fasted) had less than half as much glycogen as the unfasted controls. The acutely stressed rats which had not been fasted had 35 per cent less glycogen than the colony members; but this difference was not significant. The differences of these two experimental groups from the unfasted controls were highly significant.

A complication concerning the acutely stressed rats was that the experimental procedure not only subjected these rats to attack by another rat but also involved putting them in a strange cage. BARNETT and SPENCER (1953) showed that wild rats do not eat for a considerable period, often as long as 48 hr, when placed in a strange enclosure; the "non-fasted" acutely stressed rats undoubtedly fasted for the period during which they were exposed to attack, and their lowered liver glycogen might therefore be attributed to this, and not to the stress of attack. This difficulty was overcome by fasting some of the acutely stressed rats (and some of the controls) for 24 hr before they were used. The liver glycogen of the fasted controls was about 39 per cent of that of the unfasted controls, and not significantly different from that of the unfasted acutely stressed rats. But the stressed rats which had been fasted had a very low liver glycogen indeed: it was about 11 per cent of that of the fasted controls and only 4 per cent of the normal level represented by the unfasted controls.

Blood Glucose

Table 2 also gives the data on blood glucose. Here the picture is completely different. The "normal" level is represented by the figure 100 mg/100 ml of the unfasted controls. The fasted controls had significantly less blood sugar, but all the experimental groups had values above 100 mg. The differences are not all significant; but the group with the highest figure was that of the acutely stressed fasted rats: that is, the group with the lowest liver glycogen; and the difference between this group and

TABLE 2.—LIVER GLYCOGEN AND BLOOD SUGAR

	Liver glycogen (glucose equivalents)		Blood glucose	
	no. of rats	mg/g	no. of rats	mg/100 ml
Acutely stressed (fasted)	12	1·8 ± 0·29	13	115·8 ± 7·44*
Acutely stressed (not fasted)	8	13·2 ± 4·65†	10	110·4 ± 5·91
Colony members	15	20·2 ± 3·40†	15	112·0 ± 4·65
Controls (fasted)	10	16·8 ± 4·41	9	81·3 ± 5·63
Controls (not fasted)	17	43·3 ± 6·16	10	100·3 ± 8·32

Each mean is followed by its standard error.
* Significantly different from fasted controls ($P < 0.01$).
† Significantly different from unfasted controls ($P < 0.01$).

the starved controls is highly significant. Thus the means for the different classes of rats suggest that the effect of social stress is, if anything, to raise the blood sugar. This of course could be, and presumably was achieved, at least in part, by the depletion of the liver glycogen.

Case Histories

A difficulty in interpreting these results is that each mean has a high variance and conceals great individual differences. These differences reflect in part the familiar lability of blood sugar and, still more, of liver glycogen. A second cause of the differences between individuals was the variation in the intensity of the stress to which they were subjected, a result of differences in individual behaviour. One consequence of this was easily observed: the appearance of the rats varied greatly at the end of the experimental period. Detailed observations of behaviour were not made in every instance, but Table 3 gives some examples. The following extract from notes on the behaviour of three of the rats mentioned in the table provides a detailed illustration.

Single resident ♂, No. 430 (about 400 g), very fierce; attacks even strange ♀♀.

13.5.58. 10.00: ♂♂ 424 (265 g) and 425 (235 g), litter mates, in together after 24 hours fasting; both very lively. 430 emerges from nest box after 6 min. 424 and 425 at first freeze in corner. 424 moves, exploring; 430 approaches, defaecates conspicuously, attacks vigorously. 425 remains still. Later, 424 and 425 tend to huddle together in corner. 425 tries to crawl under 430 (an "amicable" act: see BARNETT (1958a)) and is attacked. 430 tends to await the approach of one of the newcomers, while exploring, before he attacks.

Both 424 and 425 survived the 5-hr period, but not all the members of such pairs did so. On several occasions 430 concentrated his attacks on the first rat of a pair that he encountered. If this

TABLE 3.—DATA ON INDIVIDUAL RATS

Rat no.	Liver glycogen mg/g	Blood glucose mg/100 ml	Nature of stress
306	26·3	114	control
309	—	130	severely attacked; wounded; exhausted
424	2·1	145	severely attacked
425	4·1	117	vigorously attacked; exhausted
426	28·2	74	control
427	1·1	85	attacked; sheltered in nest box
428	1·3	77	attacked; not exhausted
429	4·3	66	control
430	30·5	106	resident

Numbers 306, 309 and 430 were not fasted; the remainder had been fasted for 29 hr before death. Bracketed groups were litter mates.

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one died, 430 huddled against the body, in intervals between attacks on the second newcomer. These observations illustrate the complexity of the relationships which can exist even in such an apparently simple situation.

General Pathology

It was thought desirable to know whether the rats were suffering from any morbid condition either before they were stressed or after exposure to attack. Most of the observations on general pathology are listed in Table 4. Of the 29 rats used, 17 had some degree of chronic murine pneumonia. This is a common infection in laboratory rats, with a low mortality (MCCAY, SPERLING and BARNES, 1943; INNES, MCADAM and YEVICH, 1956). It was found in 4 out of 14 control rats, but in 8 out of 11 members of experimental colonies. The difference between the proportions is just over twice its standard error and is therefore not formally significant. Of the 5 acutely stressed rats, 4 had chronic murine pneumonia. Since the acutely stressed rats were under experiment for only a few hours, they cannot be grouped with the members of colonies; but it seems likely that there was some tendency

TABLE 4.—INCIDENCE OF PRINCIPAL MORBID CONDITIONS

	No. of rats	Lung				Kidney		Liver
		Chronic murine pneumonia			Perivascular polymorphs or lymphocytes	Nephritis	Perivascular polymorphs	Necrosis
		Mild	Moderate	Severe				
Rn controls	5	1	0	0	3	0	0	2
Rh controls	6	2	1	0	1	0	4	2
Rn colony	5	3	0	0	3	0	1	0
Rh colony	6	2	3	0	2	0	3	0
Rn acutely stressed	5	4	0	0	0	1	1	1
Resident ♂	2	0	0	1	0	0	0	1

Rn = wild; Rh = hybrid

for this kind of pneumonia to develop or to worsen in the stressed animals. However, the extent of the pulmonary lesions was not enough to cause obvious signs of weakness in any of these rats (cf. RATCLIFFE, 1949). Only one rat had severe pneumonia. This was the only one above a year old. It had been used as a resident in the experiments in which rats were subjected to vigorous attack, and was exceedingly ferocious. It was killed at the age of 22 months, when it showed some reduction in vigour; both lungs were extensively affected. This condition was probably a reflexion of age. On previous occasions 5 male rats had been killed at the age of about 2 years; they all lacked vigour and had greying hair, and on macroscopic examination extensive lesions were seen in their lungs.

The other signs listed in Table 2 were trivial. The lungs of some rats had concentrations of perivascular polymorphs or lymphocytes. This may be a reflexion of some degree of chronic murine pneumonia (cf. INNES *et al.* 1956). The kidneys sometimes had polymorphs around the blood vessels or in the peri-pelvic fat. One rat had nephritis. Six rats had small foci of necrosis in the liver of unknown origin. There was no indication, in the distribution of these conditions among the different classes of rats, of any influence of social stress.

Apart from the abnormalities shown in the table, the following were observed. One wild rat, a colony member, had an enlarged spleen. (This condition has been observed intermittently in colony members not belonging to the present series, but the cause has not been found.) Two hybrid rats, also colony members, had calcified bronchial cartilage, and one of these had also calcification of the pulmonary arteries. One wild rat from a colony had a chronic abcess in the cortex of one kidney. One acutely stressed wild rat had a small area of broncho-pneumonia with only very slight chronic murine pneumonia in the same lung. Finally, one rat had a left adrenal gland in which the glandular tissue had been wholly replaced by neoplastic lymphoid tissue: this was a wild male which had been used as a resident to attack other rats; it was killed at the age of 20 months.

DISCUSSION

The syndrome presented by males defeated in fights with other males suggested, when first observed, the possibility of a state of "shock" accompanied by hypoglycaemia (mentioned earlier as having been reported in other species). Such a condition in the rats that died would represent a failure to adapt physiologically to the "stress" of attack. The fact that the adrenal cortex of many of the most vigorously attacked rats was depleted of lipid (BARNETT, 1958b) does not wholly accord with this hypothesis; but it might do so if it were assumed that the depletion was an index, not only of hyperactivity, but also, in extreme cases, of exhaustion of cortical hormones: if the output of the latter were low, this could itself lead to hypoglycaemia.

However, not all the rats that died had grossly depleted adrenals. Moreover, the facts given above, on blood glucose and in the case histories (§§ 3.3, 3.4), do not support the view that hypoglycaemia is an important cause of death during fighting. The rats subjected to social stress, whether this was of low intensity for many days or of high intensity for a short period, displayed a notable ability to keep the blood glucose steady or even to raise it. This was especially the case with the acutely stressed rats which had been fasted, since they had the highest mean concentration of blood glucose. Yet some of the rats treated in this way died, and others were seriously distressed at the time when they were killed. There is consequently no doubt that the acutely stressed rats were being exposed to lethal conditions. If, then, hypoglycaemia did occur in these rats, it can have been only for an exceedingly brief time immediately before death (cf. SELYE, 1938). This possibility cannot be excluded, but there is no positive evidence for it. CHITTY (1957) has doubted whether hypoglycaemia is a significant factor in the death of voles subjected to this kind of stress, and we agree with him.

It remains possible that starvation contributed to the deaths of rats which (in other series of experiments) survived for some time before they succumbed. BARNETT

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(1958a) showed that both subordinate rats in colonies in which conflict occurred, and rats stressed by being put as strangers into established colonies, lost weight. However, healthy adult wild rats can survive complete starvation for at least six days (BENEDICT and FOX, 1934). Further, in disturbed colonies quantities of food were usually accumulated in the nest boxes, where it could be eaten without interruption. Therefore, although starvation may have been a factor during prolonged stress, again it seems that it can have been at most a secondary consequence of social stress; it is possible that the loss of weight observed in stressed rats was due rather to "anorexia nervosa" than to lack of access to food.

It is indeed probable that the deaths of rats under attack were due to an organic failure unconnected with these special aspects of carbohydrate metabolism. Recently, in studies of the effects of stress, it has been fashionable to pay special attention to the adrenal cortex and the effects of its hormones; although some French workers, studying the "syndrome of irritation" have emphasised changes in the autonomic nervous system (e.g. REILLY and TOURNIER, 1954). GELLHORN (1953, pp. 243, 334–5) has reviewed experiments showing that conditions of stress such as anoxia, cold and fever produce hyperglycaemia in rats; but in adrenodemedullated rats hypoglycaemia occurs instead. He concludes from this and other evidence that in the intact animal both the sympathetico-adrenal and vago-insulin systems are activated, but that normally the former has the greater effect. Our own observations suggest that the vago-insulin effect predominates in the release of liver glycogen, while there is a hyperglycaemic tendency as far as blood sugar is concerned.

RICHTER (1957) has described experiments in which wild rats were first confined in a holding bag and then dropped into water in which they had to swim to remain alive. Such rats often died at once, and electrocardiograms showed slowing of the heart beat; at autopsy the heart was found distended with blood. He suggests that the cause of death was overstimulation of the parasympathetic system. It is at least possible that the very early deaths of some socially stressed rats were due to vagal syncope.

There remains the difficult question of why attack, without wounding, by a congener should produce such a violent physiological disturbance. It cannot be the mere act of fighting, because the attackers do not become exhausted. The initial disturbance is presumably in the forebrain, but it is possible to suggest a hypothesis concerning it without knowing anything about the neurological processes involved.

The hypothesis uses as a starting-point the work of HEBB (1946). HEBB has shown that fear in chimpanzees (*Pan troglodytes*) results from presentation of an object which resembles something familiar but departs from the familiar thing in an important respect: the head of a stuffed chimpanzee without the body was one example. His suggestion is that when a "set" or expectation exists, and the object observed fails to conform to it, fear results. In wild rats an analogous response is shown in the avoidance of new objects in a familiar environment (reviewed by BARNETT, 1958d). If a neutral object, such as a box, is placed on a runway regularly used by the wild rats of a settled colony, both the box and its immediate surroundings are likely to be avoided for a time afterwards, sometimes for days. This avoidance of novelty is in contrast to the highly developed exploratory tendency of rats, and conflicts with it. (Avoidance of this sort is not displayed by albinos.) It seems that flight or avoidance, accompanied by fear, is set off by the discrepancy between what is expected and what is actually observed. The conflict between the tendency to explore and the tendency to flee,

evoked by a rat's encounter with a new object, has perhaps a more intense counterpart in the meeting of an interloper with a resident male. The conflict is again between approach and flight, since in general a rat tends to approach other rats and literally to establish contact with them (BARNETT, 1958a); such approaches, in wild rats, are accompanied, and perhaps facilitated, by the performance of stereotyped "amicable" acts.

Behaviour in such situations of conflict has been studied in detail in a few species, especially of birds and fishes (reviewed by TINBERGEN, 1952). It is sometimes found that, where there are two possible modes of response (fight or flight, courtship or attack, and so on), the animal displays neither: instead a third activity, apparently irrelevant to the situation, is performed. This displacement behaviour is sometimes observed also when a specific act is interrupted or otherwise prevented. It seems likely that the general principle of substitutive activity has a much wider application than that originally given it by zoologists (ARMSTRONG, 1950; BARNETT, 1955, 1958e), and that it may be relevant to our present problem. Rats which have been attacked often behave as if they were influenced by "conflicting drives", that is, as if two incompatible kinds of responses were simultaneously activated. They approach the aggressor, or even other rats, with much hesitation, and a slight incidental disturbance may cause flight. But they do not, in these conditions, perform displacement acts, though they seem to do so in other circumstances (BARNETT, 1958a).

Not only is there no displacement act: there is no counterpart of hysterical behaviour or other substitutive activity. All that happens, evidently, is that an autonomic output continues and leads, via the vagus or the anterior pituitary, to the endocrine and metabolic changes discussed above. On the hypothesis proposed here, it is the *absence* of substitutive behaviour which is important in this case. No consummatory act or situation is achieved, and so the internal response to emergency or stress persists, with disastrous physiological consequences. A resident male, too, is faced with a "frightening" situation when a newcomer appears: this is made very evident by pilo-erection, urination and defaecation. The feature in which the interloper departs from "expectation" is probably the absence of the colony odour. But, while an interloper makes no attack (evidently owing to the inhibitory effect of the strange environment) the resident does: that is, there is a somatic expression of the central nervous activation which results from the newcomer's presence. Consequently, one may suppose, the activation disappears, or is "discharged", and no ill effects follow.

To sum up, the hypothesis is that a male rat's encounter with a member of its own species in unfamiliar surroundings activates a system of responses of an "amicable" type. When these approaches are shown, by the resident's attack, to be inappropriate, the neural concomitants of fear are evoked; and the resulting state is exacerbated and prolonged by the fact that there are two "appropriate" courses of action, each preventing the performance of the other, and that no third act is substituted for them. At present, this is no more than a speculation; but it does suggest possibilities for further study.

SUMMARY

Adult male wild rats (*Rattus norvegicus*) were studied in three kinds of situation. (1) The control animals were kept, each alone with one female, in small cages. (2) Three colonies were set up in large cages, each containing females as well as males;

these males fought among themselves. (3) 26 rats were exposed to attack by being put each in a large cage already occupied by a fierce male.

Both experimental procedures, but especially that of group 3, led to a lowering of the liver glycogen. Blood glucose, by contrast, was higher in the experimental rats, and highest in those most severely stressed.

Although "social stress" can cause death without wounding it was not accompanied by any significant increase in infection or other easily identified morbid condition.

The physiology of social stress is discussed. A hypothesis is put forward concerning the severity of the effects of attack by a congener.

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PSYCHOSOMATIC DISORDERS AND NEUROSIS IN OUT-PATIENTS ATTENDING A GENERAL HOSPITAL

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THE purpose of this investigation was first to examine the notion that psychosomatic disease is a distinct and valid entity, and secondly to inquire whether a personality factor may be aetiologically significant in those patients with physical illnesses operationally designated "psychosomatic". If this were the case, then, some measureable aspects of the personality of the patients might be expected to distinguish those with psychosomatic diseases from those with illnesses in which a psychological component is not usually considered important.

The method by which the problems were approached was epidemiological in that the prevalence of neuroticism and extraversion (EYSENCK, 1947) were measured in an unselected out-patient population attending the two general hospitals in this area during two months. Comparisons were then made between the levels on the two personality factors obtained by patients in different diagnostic groups.

Neuroticism (N) is defined as the general emotional lability of a person, his emotional over-responsiveness, and his liability to neurotic breakdown under stress. Extraversion (E) refers to the outgoing, uninhibited, sociable proclivities of a person (EYSENCK, 1959).

The extensive experimental work by which these two independent dimensions of personality were identified will be found in EYSENCK's books (1947, 1952). The correlations found between neuroticism and certain constitutional characteristics such as body build and lability of the autonomic nervous system are particularly relevant to this investigation.

Two hypotheses relating neuroticism and extraversion to psychosomatic disorder were proposed:

(1) That the level of neuroticism will be higher in patients with psychosomatic diseases than in a control group without psychosomatic diseases.

(2) If, as is commonly believed, psychosomatic diseases result from the prolonged physiological effects of an emotion such as anxiety, patients with these diseases will be less extraverted than a non-psychosomatic control group, because it has been found that dysthymics, that is the anxious and depressed, are introverted (EYSENCK, 1947). Were one to favour the alternative view that the somatic disorders in these patients are hysterical (i.e. conversion) symptoms, then Eysenck would predict that they would be as, or more, extraverted than the controls, because he has also found hysterics are relatively extraverted.

METHODS AND PROCEDURE

Through the kind co-operation of the consultants working in 11 clinics at two general hospitals in Chichester we were able for two months to ask all out-patients aged 20–59 to complete the Maudsley

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Personality Inventory while they were waiting to see the doctor. A proportion of patients escaped us (latecomers and patients not listed, for example); but these omissions were subsequently identified and were found not to differ in age and sex distribution from those seen. We therefore examined a random sample of out-patients, unselected except for age.

The surgeon or physician, after seeing the patient, entered his diagnosis on the questionnaire. The diagnoses were then classified into four groups: (1) Psychosomatic, (2) Possibly Psychosomatic, (3) Neurotic and (4) Control. The composition of these groups was decided in advance; it is also important to emphasise that the patient's scores were not known when his diagnosis was classified.

Table 1 lists the psychosomatic, possibly psychosomatic and control diagnoses which occurred 8

TABLE 1.—DIAGNOSES WHICH OCCURRED 8 OR MORE TIMES IN THE PSYCHOSOMATIC, POSSIBLY PSYCHOSOMATIC AND CONTROL GROUPS; THE LAST IS SUBDIVIDED, WITH THE CHRONIC AND DISABLING CONDITIONS BELOW THE LINE

Psychosomatic	Possibly psychosomatic	Controls*
Asthma	Cervical Erosion	Appendicitis
Coronary Disease	Chalazion	Cholecystitis
Diabetes	Herniated Disc	Deafness
Hypertension	Low-back pain	Ear Infections
Peptic Ulcer	Lupus Erythematosus	Fractures
Pulmonary Tuberculosis	Obesity	Haemorrhoids
Rheumatoid Arthritis	Pain (no organic basis found)	Hernia
Thyrotoxicosis	Sterility	Injuries
Chronic Nasal Infection		Osteoarthritis
Dysmenorrhoea		Pregnancy
Irregular Menstruation		Prolapse
Leucorrhoea		Skin Infections
Menorrhagia		Tumors, Benign
Acne Vulgaris		Varicose Veins
Alopecia		Warts
Dermatitis		
Eczema		
Fungus Infections with Hyperidrosis		
Pruritus		Carcinoma
Psoriasis		Poliomyelitis
Seborrhoeic Dermatitis		Rheumatic Heart Disease
Urticaria		

* Chronic and disabling conditions are below the line in this column.

or more times in our sample and which are therefore the principal conditions included in these three groups.

We used an operational criterion of what was to be considered a *psychosomatic* diagnosis. The diagnoses included in the psychosomatic group were those given a chapter or paragraph heading by at least 2 of 6 writers of recent works on psychosomatic medicine (ALEXANDER, 1952; DUNBAR, 1948, 1954; HALLIDAY, 1943; HAMILTON, 1955; O'NEILL, 1955a, b; WEISS and ENGLISH, 1957).

The *possibly psychosomatic* group included: (1) those diagnoses in which psychological factors are often considered to be an important cause by some authorities, including the consultants who co-operated with us; (2) a group of disorders which, though often clearly due to an extrinsic cause, also contain many cases in whom a typical history and physical signs are not obtained, or in whom the symptoms are inexplicably prolonged, as for example, with the diagnosis prolapsed intervertebral disc; and (3) patients in whom no organic cause for the presenting symptom was found.

The *neurotic* group was largely made up of anxiety states and reactive depressions attending the psychiatric out-patient clinic.

The remaining diagnoses composed the *control* group. The list of those which occurred 8 or more

times is subdivided (see Table 1); those below the line are conditions of a very chronic or serious nature which I will refer to later.

The Questionnaire

The Maudsley Personality Inventory (M.P.I.) was devised by EYSENCK (1959) to provide a more valid and a briefer measure of the two personality factors neuroticism and extraversion than other scales used for this purpose. EYSENCK selected 261 items from the latter scales and by an item analysis found the 24 which best discriminated on neuroticism and the 24 which best discriminated on extraversion. These 48 items make up the M.P.I.. Each may be answered "YES", "NO", or "?". The appropriate "YES" or "NO" scores 2 points, and each "?" 1 point. The maximum score on neuroticism and on extraversion is therefore 48 points each.

The reliability of these scales is satisfactory (EYSENCK, 1959; BARTHOLOMEW and MARLEY, 1959).

TABLE 2.—THE NUMBER OF PATIENTS IN THE FOUR DIAGNOSTIC GROUPS SEEN AT EACH OF THE CLINICS

Clinic	Control	Psychosomatic	Neurotic	Possibly psychosomatic	Total
Medical	50	61	1	10	122
Chest	10	57	0	0	67
Diabetic	0	22	0	0	22
Skin	49	148	0	23	220
Physical Medicine	55	45	0	71	171
Orthopaedic	112	4	0	54	170
Surgical	115	15	0	19	149
Ophthalmic	36	8	0	13	57
Ear, Nose and Throat	51	25	0	2	78
Gynaecological	66	68	0	35	169
Psychiatric	2	6	115	4	127
Total	546	459	116	231	1352

We have retested samples of our groups after an interval of one year. These findings will be published; it will suffice to mention that a retest reliability of 0·84 on N and 0·77 on E was obtained in the control surgical group (KNOWLES). The scales have been standardised by EYSENCK (1959) on a representative sample of the population of England. The mean scores on *neuroticism* of various neurotic populations are consistently and significantly higher than the mean of the normal sample; *extraversion* scores are found to be lower in the dysthymics than in the hysterics, as had been predicted. The scales have therefore been well validated.

RESULTS

1. *The clinics*

1,513 patients between the ages 20–59 were asked to complete the questionnaire while waiting in one of the 11 clinics. However, 161 patients (10·6 per cent) either failed to complete the form, refused, or spoilt it; the proportion of such patients was 17·5 per cent in the psychiatric clinic but in the other clinics it varied between 8 per cent and 13 per cent. Females were over-represented in the failures; but the age distribution and the proportion of the diagnoses in the psychosomatic, possibly psychosomatic and control groups corresponded to that of the whole sample.

1,352 patients successfully completed the questionnaire. The numbers of patients in the four diagnostic categories attending each clinic are shown in Table 2.

An estimate of the number of neurotically disposed patients attending the different clinics was obtained by calculating the proportion of patients at each clinic with neuroticism scores above the median of the whole sample. Table 3 tabulates the number and percentage of patients at the principal clinics whose neuroticism scores were above the median. After the psychiatric clinic the proportion was highest in the combined medical clinics; next in order were the skin, gynaecological and physical medicine clinics.

TABLE 3.—CLINICS AND NEUROTICISM. MEDIAN NEUROTICISM SCORE OF THE TOTAL SAMPLE WAS 22·64

	Clinics ranked in order of percentage above median N.	No. above median	Percentage above median
1	Psychiatric	99	77·34
2	Medical (including diabetic and chest)	109	51·90
3	Dermatological	109	49·55
4	Gynaecological	79	46·75
5	Physical Medicine	75	43·86
6	Orthopaedic	74	43·53
7	Surgical	63	42·28
8	Ear, Nose and Throat	30	38·46
9	Ophthalmic	19	33·33

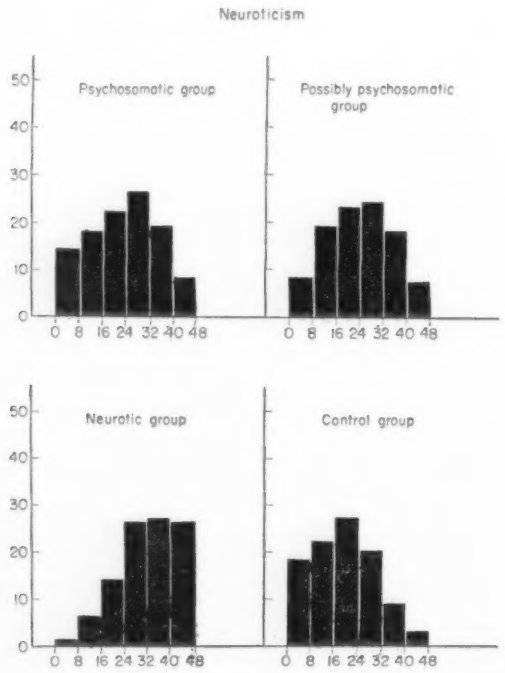

FIG. 1.—Frequency distribution (per cent) of neuroticism scores in the psychosomatic, possibly psychosomatic, neurotic and control groups.

2. *The four diagnostic groups*

Neuroticism. The frequency distribution of the neuroticism scores of the diagnostic groups are shown in the histograms (Fig. 1). Table 4 gives the number of patients in the four groups, the means and standard deviations (S.D.) of their N

TABLE 4.—MEAN NEUROTICISM SCORES AND STANDARD DEVIATIONS OF THE FOUR DIAGNOSTIC GROUPS (AND OF THE GENERAL POPULATION)

	Number	Mean neuroticism	$S.D._N$
Controls	546	18·38	10·79
Psychosomatic	459	23·81	10·32
Possible psychosomatic	231	23·10	10·94
Neurotic	116	31·95	9·15
Control Quota Sample (EYSENCK, 1959)	1800	19·89	11·02

scores. The mean and S.D. of EYSENCK's quota sample (1959) is included for comparison.

The mean N of the neurotic group is very significantly higher than the means of the other groups; the psychosomatic and possibly psychosomatic groups are very significantly higher than the control group; but the difference between the two psychosomatic groups on N is not significant (see Table 5).

TABLE 5.—LEVELS OF SIGNIFICANCE OF DIFFERENCES BETWEEN GROUPS: NEUROTICISM

	Controls	Psychosomatic	Possible psychosomatic
Psychosomatic	0·001	—	—
Possible psychosomatic	0·001	N.S.	—
Neurotic	0·001	0·001	0·001

These differences are not accounted for by the age and sex distributions of the different populations. Among the psychosomatic group, however, there were more patients who had made previous attendances at the clinics. It is therefore possible that the high level of neuroticism in the psychosomatic group may be a consequence of the *duration* of the illness.

This possibility was investigated by extracting from the control group all those patients with *chronic, disabling and prognostically serious illnesses.* Their mean N score was 18·96. This figure is not significantly different from the controls (Table 6).

TABLE 6.—MEAN NEUROTICISM SCORE AND STANDARD DEVIATIONS OF PATIENTS WITH CHRONIC AND SERIOUS DISEASES, CONTROL AND PSYCHOSOMATIC DISEASES

	Chronic or serious diseases	Controls	Psychosomatic
Number	67	546	459
Mean N	18·96	18·38	23·81
S.D.	9·08	10·79	10·32

Chronicity, therefore, does not account for the high N found in the two psychosomatic groups.

Extraversion. The frequency distributions of the extraversion scores in the four groups are shown in Fig. 2. The number of patients in the four groups (and Eysenck's

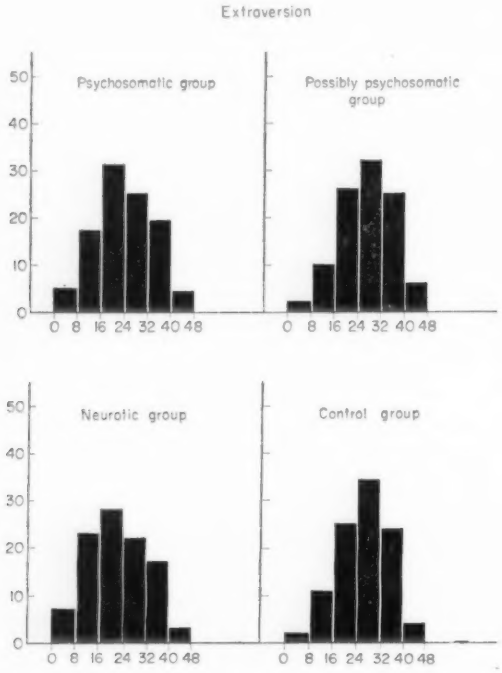

FIG. 2.—Frequency distribution (per cent) of extraversion scores in the psychosomatic, possibly psychosomatic, neurotic and control groups.

TABLE 7.—MEAN EXTRAVERSION SCORES AND STANDARD DEVIATIONS OF THE FOUR DIAGNOSTIC GROUPS (AND OF GENERAL POPULATION)

	Number	Mean extraversion	S.D.$_E$
Control	546	25·74	8·51
Psychosomatic	459	23·16	9·67
Possible psychosomatic	231	25·97	8·89
Neurotic	116	21·40	10·05
Control Quota Sample (EYSENCK, 1959)	1800	24·91	9·71

quota sample), the means and S.D.s of their extraversion scores are given in Table 7. The neurotic group is significantly less extraverted than the other groups. The psychosomatic group is very significantly less extraverted than both the control and the possibly psychosomatic group; but the latter does *not* differ from the controls on E (see Table 8).

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TABLE 8.—LEVELS OF SIGNIFICANCE OF DIFFERENCES BETWEEN GROUPS: EXTRAVERSION

	Control	Psychosomatic	Possible psychosomatic
Psychosomatic	0·001	—	—
Possible psychosomatic	N.S.	0·001	—
Neurotic	0·001	0·05	0·001

The results so far support the hypotheses. In an unselected sample of out-patients we find that those with *psychosomatic* diagnoses score higher on neuroticism than do the control patients. They are also more introverted than the controls; a finding which would support the prediction that they are dysthymic, that is to say, their symptoms are likely to be associated with anxiety or depression and the consequent disturbance of physiological function. Those with *possibly psychosomatic* diagnoses also score higher on neuroticism than the controls; this group, however, is significantly more extraverted than the clearly psychosomatic one. This result could be consistent with a hysterical explanation for some of their symptoms.

3. *Diagnoses, neuroticism and extraversion*

The similarity of the psychosomatic and possibly psychosomatic groups on N and the difference between them on E is more clearly seen when the findings for the separate diagnoses composing these groups (see Table 1) are examined.

Table 9 lists the 22 *psychosomatic* diseases which occurred 8 or more times, their means on neuroticism and on extraversion, and the levels of significance of the differences from the controls' means. It is apparent that all the psychosomatic diseases, except Coronary disease, have a level on N *above* that of the controls (in 18 out of 22 this is significant); but all of them except Acne and again Coronary disease, also have a level on E *below* that of the controls (the diagnoses in which the mean level of extraversion is significantly lower are: Asthma, Diabetes, Hypertension, Menorrhagia, Pulmonary T. B., Seborrhoeic Dermatitis, and Urticaria.

All the diagnoses in the *possibly psychosomatic* list (except Chalazion) also have a higher level on neuroticism than the controls; sterility, cervical erosion and low-back pain significantly so; but they *differ* from the list of psychosomatic disorders in that 6 out of 8 of the diagnoses have a level of extraversion at, or above the control level (see Table 10). As the combination of high neuroticism and extraversion is thought to be characteristic of hysterics, it should again be considered whether the list of *possible* psychosomatic diseases differs from the psychosomatic in that hysterical mechanisms are predominant in determining the symptoms in the one, and physiological dysfunction of emotional origin in the other.*

In the *control* group, however, no consistent pattern in the relations between the two factors and the diagnoses is found (see Table 11). Moreover, with only 4 exceptions these diagnoses do not differ significantly on either N or E from the control group as a whole.

The exceptions are of interest:

(1) Patients with warts are significantly more neurotic and more extraverted than

* The probability of obtaining by chance the dysthymic combination of N and E observed in the psychosomatic group and the hysteric combination observed in the possibly psychosomatic group is less than 0·005 (Fisher exact probability test).

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TABLE 9.—NEUROTICISM AND EXTRAVERSION MEANS OF PSYCHOSOMATIC DIAGNOSES WHICH OCCURRED 8 OR MORE TIMES AND THE SIGNIFICANCE OF THEIR DIFFERENCES FROM THE MEAN OF THE CONTROLS

Diagnosis	No.	Neuroticism			Extraversion		
		Mean	*P*		Mean		*P*
Dysmenorrhoea	9	29·22	0·001		24·89		N.S.
Urticaria	10	27·20	0·01		20·80	0·01	
Leucorrhoea	13	27·08	0·005		24·92		N.S.
Fungus infections	9	26·44	0·005		24·11		N.S.
Alopecia	17	26·35	0·001		23·11		N.S.
Asthma	14	26·07	0·01		20·86	0·05	
Eczema	32	25·03	0·005		23·03		N.S.
Menorrhagia	32	24·84	0·001		23·41	0·05	
Seborrhoeic Derm.	23	24·83	0·01		21·65	0·025	
Psoriasis	28	24·75	0·005		23·46		N.S.
Hypertension	19	24·68	0·005		21·16	0·05	
Diabetes	37	24·50	0·005		21·00	0·025	
Pulmonary T.B.	54	24·28	0·001		21·89	0·01	
Irregular Mens.	12	24·25	0·005		23·08		N.S.
Dermatitis	17	23·94	0·025		24·59		N.S.
Chronic Nasal Inf.	14	23·29	0·05		22·43		N.S.
Thyrotoxicosis	14	22·29	0·05		23·73		N.S.
Rheumatoid Arth.	42	21·95	0·05		25·10		N.S.
Pruritus	13	21·53		N.S.	23·54		N.S.
Peptic Ulcer	22	21·41		N.S.	24·59		N.S.
Acne Vulgaris	9	19·40		N.S.	28·33		N.S.
Coronary Disease	12	15·92		N.S.	26·00		N.S.
Control patients	546	18·38	—		25·74	—	

TABLE 10.—NEUROTICISM AND EXTRAVERSION MEANS OF POSSIBLY PSYCHOSOMATIC DIAGNOSES WHICH OCCURRED 8 OR MORE TIMES AND THE SIGNIFICANCE OF THEIR DIFFERENCES FROM THE MEAN OF THE CONTROLS

Diagnosis	No.	Neuroticism		Extraversion	
		Mean	*P*	Mean	*P*
Sterility	8	28·38	0·01	25·63	N.S.
Cervical erosion	15	24·40	0·01	27·73	N.S.
Low-Back Pain	43	23·33	0·01	23·44	N.S.
Lupus Erythematosus	10	22·30	N.S.	25·80	N.S.
"Herniated Disc"	37	21·49	0·025	25·81	N.S.
Obesity	9	21·78	N.S.	26·67	N.S.
Pain (no organic basis found)	30	20·67	N.S.	25·87	N.S.
Chalazion	12	16·17	N.S.	28·17	N.S.
Control patients	546	18·38	—	25·74	—

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TABLE II.—NEUROTICISM AND EXTRAVERSION MEANS OF CONTROL DIAGNOSES WHICH OCCURRED 8 OR MORE TIMES AND THE SIGNIFICANCE OF THEIR DIFFERENCES FROM THE MEAN OF THE WHOLE CONTROL GROUP

Diagnosis	No.	Neuroticism			Extraversion		
		Mean		*P*	Mean		*P*
Appendicitis	12	19·17		N.S.	23·75		N.S.
Cholescystitis	8	21·25		N.S.	24·80		N.S.
Deafness	8	17·38		N.S.	30·00	(0·01)	
Ear Infections	20	20·90		N.S.	26·50		N.S.
Fractures	51	18·29		N.S.	28·14	0·05	
Haemorrhoids	9	23·00		N.S.	26·00		N.S.
Hernia	19	18·68		N.S.	25·20		N.S.
Injuries	60	19·00		N.S.	25·80		N.S.
Osteoarthritis	25	19·40		N.S.	25·12		N.S.
Pregnancy	13	20·62		N.S.	28·00		N.S.
Prolapse	25	24·2	0·05		20·4	0·01	
Skin Infections	14	13·57		N.S.	26·07		N.S.
Tumours, Benign	22	15·0		N.S.	23·23		N.S.
Varicose Veins	20	17·10		N.S.	27·85		N.S.
Warts	8	29·13	0·01		32·88	0·01	
Carcinoma	16	22·31		N.S.	21·69		N.S.
Rheumatic Heart Disease	10	19·00		N.S.	21·90		N.S.
Poliomyelitis	9	15·77		N.S.	26·77		N.S.
Control	546	18·38	—		25·74	—	

the controls and therefore clearly follow the "hysterical pattern". The common observation that they may be "charmed away" is worth recalling in this context.

(2) The prolapse cases, on the other hand, reflect the dysthymic pattern of the psychosomatic diseases (significantly high on N and low on E). A relation between prolapse, hypotonus and emotion has been postulated by KROGER and FREED (1951).

(3) Of special interest is the finding on the fracture patients; this diagnosis was exceptional in that it is the only condition in the 48 considered in which the mean N is low but the mean E is significantly high. The liability to fractures is therefore found to be associated with more than normally outgoing and uninhibited tendencies in the personality. This finding may throw a little rational light on the concept of accident-proneness.

(4) The findings on deafness are statistically unsatisfactory; this is the only instance in which the variance ratio (F) is significant.

DISCUSSION

Are there psychosomatic disorders?

One of the uses of epidemiology described by MORRIS (1957) is that it provides a method for identifying syndromes. This approach is therefore of considerable potential value in psychiatry where the need to define diagnostic entities is still a

major problem. In this survey of out-patients attending the principal clinics in the hospitals in Chichester, the personality factors neuroticism and extraversion were measured and compared in four major diagnostic groupings, and also in each diagnosis which occurred often enough to be treated statistically. It was found that the psychosomatic diseases could be differentiated from other diseases on these psychological criteria.

The survey may be criticised on the grounds that it was incomplete. About 10 per cent of patients failed to complete the questionnaire satisfactorily and a proportion of patients were missed altogether. But analysis of these incomplete and missed cases by age, sex and diagnoses showed that they did not differ from those examined in any relevant respects. It may be concluded, with reasonable confidence, that the omissions were of a random kind and that the out-patients examined were an unbiased sample of the population being surveyed.

Patients with diseases commonly designated as psychosomatic were found to be more neurotic than patients with non-psychosomatic diseases. This was also true of each psychosomatic disease separately considered (except coronary thrombosis). The first hypothesis, that patients with psychosomatic diseases would be more neurotic than the controls was therefore supported.

The psychosomatic patients differed from the controls in another respect; they were more introverted. The psychosomatic out-patients were therefore clearly differentiated on two dimensions of personality. It may be concluded from the epidemiological evidence that the concept of "psychosomatic disease" is a valid one.

Another group of patients, those with "possibly psychosomatic" disorders, were also differentiated from the controls on neuroticism, but not on extraversion. Extraversion differentiated this group from the accepted psychosomatic cases, however. Different combinations of N and E were therefore obtained for the psychosomatic and possibly psychosomatic diagnoses. The probability of finding the differences observed by chance was less than 0·005. The tentative conclusion as regards the second hypothesis, therefore, is that patients with diseases usually considered psychosomatic are dysthymic (hypertensives, for example), and it may be supposed that the physiological effects of emotional instability underlie their disorder. But there is also a second group of diseases apparently associated with a more hysterical (extraverted) type of personality (obesity, for example).

Though the investigation has provided statistical evidence for two personality types, each predisposed to certain somatic symptoms or illnesses, the clinical difference between the list of psychosomatic and possibly psychosomatic diseases is not at all clear, particularly as regards the hysterical nature of the latter list of diseases. Generally considered, however, the clinical distinction adumbrated is a feasible one and conforms with the clinical fact that somatic symptoms in neurotics are sometimes ascribable to the effects of anxiety and sometimes to hysterical conversion.

Can the findings on neuroticism and psychosomatic disease be attributed to defects in the design of the inquiry?

(1) Are they a consequence of the form of the questions making up the M.P.I.? This test was chosen partly because none of the items referred to somatic symptoms, so that the patient's presenting complaints at the clinic would not be expected to influence his scores on N or E and would not, therefore, lead to spuriously high N scores in selected diseases.

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(2) As the psychosomatic illnesses tend to be chronic will they engender a secondary neurotic reaction on this account? Control patients with very chronic illnesses were found to be less neurotic than the psychosomatic patients (see Table 6). Chronicity therefore did not account for the high N scores found in the psychosomatic diseases.

(3) Is there a tendency for the out-patient departments of a general hospital to select neurotic patients—the worrying person who seeks an opinion or treatment other than his general practitioner's? Were this so, patients with the control diseases would be selected in this way as well as patients with psychosomatic diseases; but the mean neuroticism score of the control group was found to be less than that of the general population (EYSENCK's quota sample). It therefore seems unlikely that a selection of this kind is affecting the findings. Moreover, the mean neuroticism scores of patients attending with skin infections, minor injuries, or pregnancy, conditions which might very well have been diagnosed and treated by the general practitioner, were no different from the mean of the remainder of the controls.

Personality and psychosomatic disease

Many investigators have sought to account for the different psychosomatic diseases in terms of differences in personality. The principal exponent of the view that each disorder is characterised by a typical or distinctive personality is FLANDERS DUNBAR (1943). However, the consensus is that the similarities in the personality profiles obtained from patients with various psychosomatic illnesses is more evident than the differences. 28 out of the 30 psychosomatic and possibly psychosomatic diagnoses I investigated were associated with neurotic tendencies in the personality. It therefore seems likely that the failure to discover a clear association between these diseases and a characteristic type of personality has been because the traits previously described in these patients are those common to most neurotics. Dependency, resentment, and passivity, for example, are among the traits frequently claimed as distinctive of a number of diseases; but they are also familiar attributes of the neurotic.

Psychosomatic diagnoses separately considered

LEIGH and MARLEY (1956) made a careful study of psychiatric symptoms in *asthma* and distinguished a frankly neurotic group from one in which other traits, not clearly neurotic, differentiated the cases from healthy controls. I believe that most of the psychosomatic diagnoses in this study could probably be similarly divided into those in which a neurotic personality will be the primary consideration both as regards the aetiology and the management of the case and another in which somatic factors will be preponderant. Perhaps the psychosomatic group had a lower score on N than the neurotic one because other variables were playing a relatively larger part in determining the former.

Patients with *pulmonary tuberculosis* who are attending a follow-up clinic were found to have a mean neuroticism score above that of a control group. The importance of the tuberculous patient's psychology in relation to the onset and course of the disease has been discussed by DAY (1951) and WITTKOWER (1949), and has recently received some objective support; KISSEN (1958) found that patients with tuberculosis had had significantly more neurotic and psychosomatic illness than had matched

controls; they were further distinguished on an aspect of personality—their need for affection.

As there is little experimental evidence in the literature supporting the notion of a neurotic predisposition in *hypertension*, *diabetes* and *rheumatoid arthritis* the finding that unselected out-patients with these diseases have significantly high neuroticism scores is of interest. *Coronary disease* was the only condition regularly described in the textbooks on psychosomatic medicine in which neuroticism was less than that of the controls. The sample was a very small one, however. If the observation is valid it would suggest that, from the psychological aspect, *coronary thrombosis* and *angina* depend less on enduring attributes of personality than on the physiological effects on the cardiovascular system of momentary stresses. The findings on *peptic ulcer* are equivocal. This sample was also small and not wholly satisfactory as the diagnoses had not been confirmed radiologically in a third of them when our data was tabulated.

Muscular hypertension has been found to accompany anxiety and there is some evidence that this is the physiological mechanism underlying such symptoms as post-occipital headache and backache (HOLMES and WOLFF, 1952; SAINSBURY and GIBSON, 1954). The significantly high levels on neuroticism in patients referred with *backache* provides evidence of another kind that there is often a neurotic predisposition in this condition. A possible relation between *uterine prolapse* and hypotonus of psychological origin was referred to when the neuroticism scores of patients with prolapse was described.

The high neuroticism levels found in patients with *dysmenorrhoea*, *leucorrhoea*, *menorrhagia* and *sterility* need emphasis as controlled investigations relating abnormalities of personality and the common menstrual disorders have seldom been attempted. A notable exception is a paper by WITTKOWER and WILSON (1940) on the personalities of patients with dysmenorrhoea and sterility. The significantly high neuroticism score found in patients with *cervical erosion* might be worth pursuing. The pH of the cervical and vaginal secretions, oestrogen levels and menorrhagia may be factors maintaining the erosion; they are also physiological activities which may vary with the patient's emotional state.

Nearly all the skin diseases which are commonly thought to be determined, in part, by psychological factors were found to be associated with levels of N which were significantly higher than the controls' levels. They were *urticaria*, *fungus infections* associated with *hyperidrosis*, *alopecia*, *eczema*, *seborrhoeic dermatitis*, *psoriasis* and *dermatitis*. Patients with *pruritus*, however, scored a little higher than the controls on neuroticism, but not significantly so; the small sample of cases with *acne vulgaris* did not differ from the controls.

Only two diagnoses were associated with a significantly high extraversion score were *fractures* and *warts*. The relevance of the former finding to accident proneness was commented upon.

SUMMARY

1. For two months all out-patients (age 20–59) attending 11 clinics at two general hospitals were asked to complete the Maudsley Personality Inventory while waiting to see the doctor. Their diagnoses were obtained and divided into four operationally defined groups: psychosomatic, possibly psychosomatic, control and neurotic.

2. The patients in both the psychosomatic and possibly psychosomatic groups had significantly

higher scores on neuroticism than had the controls. Thirty diagnoses in these two groups were separately examined; patients with 22 of the diagnoses had significantly higher neuroticism scores than had the controls.

3. The psychosomatic group was significantly more introverted than the control but the possibly psychosomatic did not differ from the control on extraversion.

4. Patients with chronic, serious and disabling diseases did not differ from the controls on neuroticism.

5. The clinics with the greatest proportion of patients scoring high on neuroticism were the psychiatric, general medicine, gynaecological, skin and physical medicine, in that order.

6. The findings on the relation between neuroticism and extraversion and some of the diagnoses were discussed.

7. It was concluded: (a) that as in a representative sample of out-patients those with psychosomatic diseases could be differentiated from those without on both neuroticism and extraversion, psychosomatic diseases should be considered a distinct entity; (b) that some evidence was found for distinguishing two categories of psychosomatic disease, those associated with a dysthymic and those with an hysterical personality.

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THE DEPTH OF SLEEP IN ENURETIC SCHOOL-CHILDREN AND IN NON-ENURETIC CONTROLS*

MARY M. M. BOYD

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INTRODUCTION

UNUSUALLY deep sleep is commonly stated to be a factor in nocturnal enuresis, and many patients are given treatment aimed at lightening sleep.

Trousseau, nearly 100 years ago, first noticed excessive depth of sleep in enuretics. BRAITHWAITE (1956) found that 185 (68%) of 273 enuretic children gave a history of very deep sleep; only 113 (23%) of 500 "unselected" non-enuretic children were said by their parents to be difficult to wake. He does not state how often and at what time of night the parents of these non-enuretic children had tried to wake them. To lessen depth of sleep BRAITHWAITE treated eighty children with amphetamine sulphate; 45 of the 80 were unaffected by it. Conversely he treated 21 children with phenobarbitone and only 5 of these were not improved.

HODGE and HUTCHINGS (1952) obtained a history of heavy or very heavy sleep in 65 of 131 enuretic children, and gave increasing doses of amphetamine, after which 45% improved or became dry. Others who obtained histories of deep sleep or consider it important are ROLAND (1954), BETT (1953), ATLEE (1952), ZELTNER (1951), STROM-OLSEN (1950), COOK (1950), CAMERON (1946), STALKER and BAND (1946), STOCKERT (1938), and MOLITCH and POLIAKOFF (1937). Treatment with amphetamine or ephedrine was given by a number of these authors to lighten sleep, with variable results, never completely satisfactory. LOMBARDINI *et al*. (1948) compare enuresis with the incontinence of alcoholic intoxication. LECHLER (1951) considers that the child does not wake for micturition because he does not want to interrupt the pleasurable business of sleeping. STEELE (1935) relieved enuresis in 123 of 143 children in a home for high-grade morons by training, wakening, and potting alone. The remaining ten relapsed after training and were reported difficult to waken. They were given caffeine grain 2½ nightly for 3–4 weeks, and 8 remained dry afterwards.

CHRISTOFFEL (1934), however, found that fatigue diminished bedwetting. He pointed out the specificity of waking stimuli, a point made also by LACASSIE (1946), who comments that after observation he hesitates to accept profound sleep as an explanation of bedwetting, since a tempest may not awaken an individual while a pendulum clock will. He also found that some enuretics sleep restlessly and lightly.

ANDERSON (1930) decided that depth of sleep is an observation so inconstant as to warrant no conclusion of its being causative. SCHACHTER (1936) states that micturition in infants is frequent in waking hours but does not occur for hours at a time during the night's sleep. He discusses the opposing views on the significance of depth of sleep in enuresis; and he considers that Christoffel is right in saying that if enuretics slept soundly they should show retention of urine as in other pathological conditions, and not incontinence.

GERARD (1939) found that in only 4 out of 72 enuretics she dealt with, wetting occurred during the period of deepest sleep. She laid the blame for this on faulty training. STOCKWELL and SMITH (1940) did not find that their series of one hundred child enuretics slept more deeply than other children, but record no details of their investigation of this point. WEBER'S (1946) observations of enuretic children showed that some wet the bed when restless and half awake. He watched the sleep of these along with that of other nervous or difficult children in an observation ward, and found that there was no appreciable difference, except that enuretics were sometimes difficult to arouse for the purpose of micturition. He does not say whether he tried to arouse others for this purpose too. KANNER

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(1948) says that it is hardly justified to speak of "abnormal" depth of sleep in enuretic children. Some enuretics are light sleepers and both sound sleepers and light sleepers are reported among non-enuretic children and adults.

HELSBORG (1950) investigated the EEG in enuretics, and on sleeping patients when enuresis occurred on three occasions, and found no support for enuresis occurring in unusually deep sleep nor accompanying a minor epileptic attack. WALLINGE (1954) noted that a person who has bladder control at night does not wet the bed when sleeping under sedation.

MEREDITH CAMPBELL (1951) after extensive investigation of enuretic children, considers that the deep sleep is not an aetiological factor, though it is offered by parents as an excuse for lack of proper training and affection for the child. BAKWIN (1948) writes categorically "Depth of sleep has no relation to the etiology of enuresis." The first controlled investigation in the literature into the awakening of enuretic children was carried out by COURTIN (1923). He found from his careful and detailed methods of awakening 56 children, including 15 enuretics, that there was no relation between depth of sleep and enuresis. Since the present investigation was completed two additional papers on the subject have appeared. DITMAN and BLINN (1955) carried out continuous EEG studies on 25 enuretics asleep including 3 children of 5, 6 and 7 years. In 2 of these there was a change from deep sleep to light sleep before enuresis occurred. Their investigation showed that nocturnal enuresis can occur at any level of sleep, and in adults it occurs mostly during physiological wakefulness. In one child it occurred in deep sleep; but there was no comparison of the depth of "deep sleep" between enuretic and non-enuretic children.

BOSTOCK (1958) compared parental accounts of the difficulty of awakening enuretics and non-enuretic sibs. He also tested 7 enuretics and 12 non-enuretics twice each with a measurable source of sound. Two enuretics and one non-eneuretic did not awaken. After giving these children an arbitrary waking time of 720 sec he found the enuretics averaged 418 sec to awaken and the non-enuretics 319 sec.

INVESTIGATION

Observations were made on 111 enuretic children aged 5–15 years inclusive, 73 boys and 38 girls, comprising all children of this age group who complained of enuresis or were found to be enuretic, and who attended the Out-Patient Department of a Children's Hospital during a consecutive period of 16 months. All were admitted for investigation. Eleven of the children are not included in this study for the following reasons: 4 boys were diurnal enuretics only, one girl had severe spina bifida with paralysis and sensory loss, 2 children had severe infected hydronephrosis, and two had chronic pyelonephritis; one boy had severe renal insufficiency with polyuria of fixed specific gravity and one boy had no EEG owing to difficulties in arrangements. One hundred children with normal urine, a normal intravenous pyelogram and no neurological abnormality, 65 boys and 35 girls, thus from the material of this study. 46% were 5 to 7 years, 34% 8 to 10 years, 20% 11 to 15 years.

Every parent or guardian was directly questioned as to whether the child slept deeply or not. Sixty eight replied that they did, though one of these was also reported to talk in his sleep and another was said to be restless. Thirty two replied that the children did not sleep deeply, but of these five had never been lifted.

An equal number of non-enuretic control children were matched with the patients. There was no "choice" of controls, who had to be children in hospital, free from pain, who could be wakened with no detriment to themselves. There had to be no disease involving the central nervous system present, the controls could not be newly admitted, so that patients waiting operation could not be used. The control children had, in fact, recovered from a variety of complaints and investigations at the time of the tests. As far as possible the controls matched the patients in age and in every case were within one year of the patients' age. They also matched in sex as a whole, but as

will be seen from Table 1, they could not all be matched individually in regard to both age and sex.

Table 1 sets out the ages and sexes of the patients and of the controls.

The controls slept in the same wards as the patients, and were awakened at the same times, so that external conditions were alike for both. After being left for a few nights to settle down to ward conditions the children were awakened in a similar manner by the same person throughout, on three nights, usually successive, between

TABLE 1.—CONSTITUTION OF THE EXPERIMENTAL GROUP

	Enuretics			Controls		
Ages in years	Boys	Girls	Totals	Boys	Girls	Totals
5	13	6	19	15	4	19
6	6	6	12	7	7	14
7	11	4	15	10	3	13
8	8	3	11	6	4	10
9	6	3	9	6	4	10
10	9	5	14	8	6	14
11	6	3	9	6	2	8
12	2	2	4	4	1	5
13	4	1	5	3	2	5
14	0	0	0	0	1	1
15	0	2	2	0	1	1
Totals:	65	35	100	65	35	100

9 p.m. and midnight. The response the third time did not show any evidence of "conditioned reflex" and was not as a rule more rapid than the first.

The method of awakening the children was by standing near the child's head on the right, he was addressed in a quiet spoken voice by name: "Sit up, John."; this was repeated at the same time as a hand was placed gently on the child's left shoulder; the request was repeated and if there was no response the shoulder was gently shaken; the words and the shaking were repeated quietly but urgently every few seconds, until the child sat up. The time was taken in seconds from first speaking to the child till he sat up. The opportunity was then taken of "potting" the enuretics, and they were always found to be aware of what was going on, although a few objected to being potted on first awakening. They probably felt no desire to void, as this awakening was not timed to prevent wetting.

The controls were awakened in the same way, using the same tone and intensity of voice, sometimes before the enuretics and sometimes after them. There was no disturbance of the children in the wards by this method, so it made no difference which child was awakened first. In no case were children in neighbouring beds involved in the investigation.

Only twenty-one enuretics had no wet beds in hospital and these included the oldest children, and those with the adult type of cystometrogram, who remained dry after discharge. The children's sleep was, therefore, not so unusually light in hospital that enuresis was prevented, for the majority had several wet beds each during their

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stay of approximately a week. There were 241 recorded wet beds among 79 children, in spite of regular "potting" in the later evening. The waking of the children took place either before this, or over an hour later so that they were thoroughly settled down again.

Table 2 shows the mean waking times of the enuretics and of the controls, together with the standard deviations:

TABLE 2.—MEAN WAKING TIMES OF 100 ENURETICS AGED 5–15 (3 TIMES EACH) AND 100 CONTROLS.

	Mean in sec	S. D.
Enuretics	16	14·9
Controls	20·5	24·7

The mean waking time of the control group was unduly weighted by a small number of very deep sleepers. The mean, omitting the four heaviest sleepers, is 16·7 sec. 75 enuretics and 72 controls always awakened in 30 sec or less. 4 controls but no enuretics took over two min to awaken on one or more occasions. 31 of the enuretics were always awakened in 10 sec or less, but only 7 of the 21 patients who had

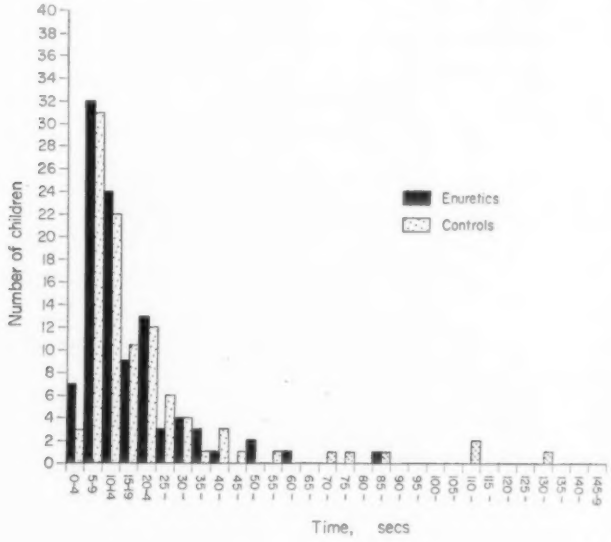

FIG. 1.

no wet beds in hospital belonged to this set. Six of these dry patients took over half a minute to awaken on one or more occasions.

The histogram in Fig. 1 shows the average waking time for each enuretic, grouped in five sec intervals, compared with the average waking time of each control, similarly grouped. The histogram in Fig. 2 sets out the waking times of each child on each occasion, again grouped in five sec intervals, together with the simple waking times of the controls, 600 in all for the 200 children. It is clear that there is no significant

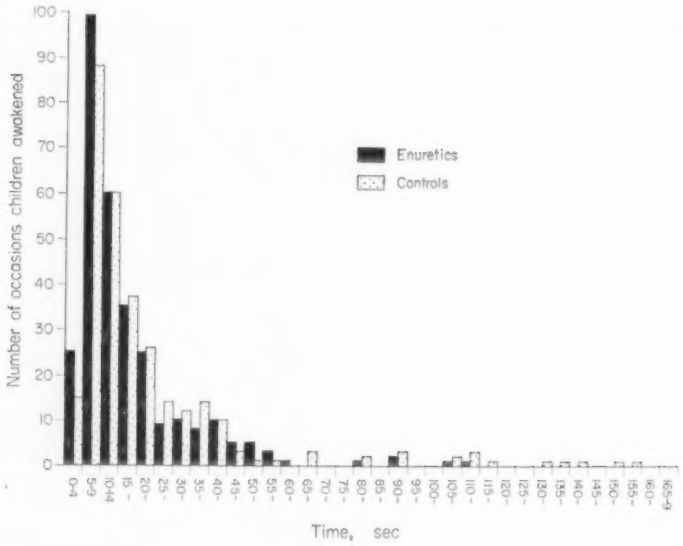

FIG. 2.

difference in depth of sleep, as measured by the rapidity of awakening by an adult, between enuretic and non-enuretic children.

As part of the investigation an EEG was done and the I.Q. measured by an educational psychologist. Table 3 shows the enuretics grouped by the type of EEG and for each group, the mean waking times and standard deviation, together with the mean I.Q. and standard deviation.

TABLE 3.—RELATIONSHIP BETWEEN EEG WAKING TIMES AND I.Q. OF 100 ENURETIC CHILDREN

EEG	No. of children	Waking time in sec		I.Q.	
		Mean	S.D.	Mean	S.D.
Normal	16	16·8	14·46	101	13·67
Borderline normal	8	16·0	9·14	99·8	13·68
Mild or moderate abnormality	53	16·9	15·17	99	14·54
Highly abnormal	21	13·9	6·37	91	19·83
Epileptic with fits	2	5·5	0·05	86·5	8·52

The EEG showed mostly immature patterns of activity, although in some, especially a few of the highly abnormal cases, there was an epileptiform picture. The mean I.Q. of the highly abnormal group is unduly affected by two children in the group with I.Q.s of 47 and 48. Without them the mean I.Q. of the group is 95·5. In this series there is no significant correlation between depth of sleep and degree of abnormality of EEG or the I.Q.

DISCUSSION

The results of this investigation are parallel to those of COURTIN (1923), and demonstrate that unusually deep sleep is not a factor in the production of nocturnal enuresis. Parents carefully avoid waking their non-enuretic children at night except

in rare and unusual circumstances, but often feel obliged to lift an enuretic when they are themselves tired and wishing to get quickly to bed. It is also possible that the child resents being singled out and awakened impatiently by the parent who feels his wetting is a nuisance. In such a case the child may decline to respond to his parent, though not deeply asleep.

As there is no evidence from controlled investigation that great depth of sleep is a factor in enuresis, what explanation is there for the proportion of successes in treatment by amphetamine in a number of series?

BAKWIN (1938), and also WINTER (1941), point out that there are other explanations for the effect of amphetamine on nocturnal enuresis, such as relief of anxiety or a direct effect on the bladder musculature. A direct effect on the bladder or its sphincters was noted by CARTWRIGHT (1954), similar to that of ephedrine, and also by O'CONNOR (1937), and was discussed in an Annotation in the B.M.J. This resulted in retention of urine. LOMAN, GREENBERG and MYERSON (1938) found relaxation of the human urinary tract with 20 mg of Benzedrine Sulphate administered intravenously, including enlargement of the bladder to more than twice its original size. Atropine appeared to be synergistic with Benzedrine in its action on the bladder. WINTER (1941) found that Benzedrine had a greater effect on the bladder capacity and urethral resistance than ephedrine. IVY and KRASNO (1941) also report that in man amphetamine apparently promotes relaxation of the ureter and urinary bladder and may in large doses (30 mg of the sulphate daily) cause spasm of the sphincter of the bladder. A direct effect on the bladder musculature is not surprising in view of the effect on the stomach emptying time due to increased pyloric tone, investigated by BEYER and MEEK (1939), and VAN LIERE and SLEETH (1938).

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There is reasonable evidence then for a direct effect similar to atropine and ephedrine on the bladder mechanism, sufficient to account for the therapeutic efficacy of amphetamine in nocturnal enuresis without the need to invoke lightening of unduly deep sleep as an explanation.

CUTTS and JASPER (1939) found little effect on EEG rhythms except slight accentuation of alpha waves, in children on 20 mg Benzedrine Sulphate per day.

Whatever the significance of immaturity or abnormality of the EEG in enuretics may be, that is not changed appreciably by amphetamine, and reasons for its efficacy cannot be found there. In any case 24% of the present series of severe enuretics have normal or borderline normal EEGs, and TURTON and SPEAR (1953) found 49% of their series of 100 cases had normal or borderline normal EEGs.

In the present series no clue to the character of the EEG could be found in studying the personalities and behaviour of the children. The latter was definitely immature in 8 of the 16 children with normal EEGs; 4 more were shy. Among the 53 children with mild to moderate immaturity of EEG, 10 were definitely immature in behaviour, 13 shy and 9 anxious, but the rest were pleasant and co-operative normal children. Of the 21 children with highly abnormal EEGs, 5 behaved immaturely, 3 were shy and 5 anxious. The 2 epileptics were co-operative and pleasant, and placid on treatment. After the relief of their enuresis there was a striking increase in self-confidence in the shy and anxious children.

SUMMARY

The results of an investigation into wakening 100 nocturnal enuretic children with normal urine, I.V.P., and neurological systems, together with 100 non-enuretic controls are presented.

The EEG and I.Q. shows no significant correlation with ease of awakening.

An explanation for the therapeutic efficacy of amphetamine in nocturnal enuresis is put forward.

Acknowledgements—My thanks are due to Professor NEALE for making available facilities for this investigation and for permission to examine his patients, as well as for constant advice and help; to Dr. BERYL CORNER, Dr. APLEY and Dr. BARBOUR for access to a number of cases. Dr. BARBOUR gave advice and help and arranged the I.Q. estimations; Professor GOLLA and Dr. TURTON also gave assistance with EEG reports; my thanks are also due to Mr. SHADDICK for statistical advice.

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GASTRIC NEUROSIS, PRE-ULCER CONFLICT, AND PERSONALITY IN DUODENAL ULCER

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INTRODUCTION

CONFLICT is an ambiguous term when used in the literature on duodenal ulcer. On the one hand, the term is used to mean the ulcer personality conflict, or the conflict arising in early childhood which continues until the development of the duodenal ulcer. On the other hand, the conflict may be the life situation more or less immediately preceding the pathophysiological disturbances leading to duodenal ulcer. In this paper the former is described as *the ulcer personality conflict*, the latter *the pre-ulcer conflict*. Most investigators agree upon the existence of both types. In saying that "ulcers usually develop in personalities with a deep-seated neurotic conflict", ALEXANDER (1952) emphasizes the significance of the ulcer personality conflict. But when explicitly declaring that the dependent tendencies may be frustrated by external circumstances he concurs in the assumption of a pre-ulcer conflict. On the relationship between the ulcer personality conflict and the pre-ulcer conflict there are different opinions. On the one hand the pre-ulcer conflict is considered negligible, because it is held to be a product of the ulcer personality; on the other hand some workers maintain that the external circumstances at the core of the pre-ulcer conflict are frequently beyond and outside the patient's control. It seems more likely that the relationship varies from case to case, that there is a continuum at one pole of which is the almost exclusive ulcer personality conflict, and at the other pole an ulcer disease elicited by a pre-ulcer conflict. The principal aim of this study was to inquire into the nature of the pre-ulcer conflict and the relationship of duodenal ulcer to gastric neurosis and the patient's personality.

MATERIALS AND METHOD

All patients with a duodenal ulcer verified by X-ray examination were investigated in four departments of internal medicine in Helsinki in 1956 and 1957 during two periods, each of which covered several months. No patient was excluded for any reason. The series comprised 50 patients, 38 men and 12 women all suffering from duodenal ulcer at the time of investigation with the exception of 2 patients, who, having had an ulcer earlier, now sought medical examination because of epigastric distress. Despite the avoidance of any conscious selection, some selective factors influenced the composition of the series of patients. Owing to the shortage of hospital beds only severe cases, or cases which could not get treatment, food, and rest at home were admitted to the hospitals. Because of the municipal character of the hospitals no rural person and only 2 subjects belonging to the higher social groups were represented in the series.

The investigation was explained to the patient by his doctor, who told him that it had been proved that the development of an duodenal ulcer is in some cases and to a certain extent due to strain and overwork (intentionally these non-psychiatric terms were employed). The patient was then informed of the examination to be carried out by the writer. Each investigation, performed as an informal interview, covered the same items without the patient being aware of it. In addition to questions

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about the duodenal ulcer these items included other somatic complaints and diseases, relation to family, employment, money, social career, aggressiveness, fears, and food. The principal inquiry concerned serious conflicts in the patient's life. In view of the fact that unhappy external circumstances as such do not constitute a life conflict, the patients' behaviour during the conflict and his own estimation of its stress-producing, anxiety-producing power were studied. Parallels were drawn between the stress-producing situation preceding the ulcer disease and other conflicts before and after, in order to determine whether this conflict was particularly severe or, from the patient's point of view, even insoluble. The method no doubt contains a subjective aspect, being open to criticism for that very reason. But there is no psychometric device for inquiring into a past conflict, or for determining the stress-producing power of such a past conflict. On theoretical grounds, we even

TABLE I.—DYSPEPSIA PERIODS PRIOR TO ULCER I

Dyspepsia periods	No. of patients	Mean age on diagnosis of ulcer I
Dyspepsia periods since childhood	6	40·3
Dyspepsia periods beginning later in life (mean age of onset: 30·6)	32	39·0
No dyspepsia period prior to dyspepsia leading to ulcer I	12	38·2
Total	50	39·0

question the possibility of devising such a psychometric test. The only way of verifying or rejecting the results obtained by the method described is to repeat the investigation, applying the same method, on a similar series of patients.

Previous dyspepsia periods not leading to ulcer

ALEXANDER (1952) holds that intensive studies of cases of peptic ulcer have afforded convincing evidence for the view that emotional conflicts of long duration may lead to gastric neurosis, which may in time result in an ulcer. In order to prove this hypothesis attempts were made to study whether the ulcer patients had suffered from dyspepsia prior to and apart from the gastric disturbances leading to the ulcer. ("Dyspepsia" in this paper stands for epigastric distress, gastric pain, etc.) The second pertinent question concerns the character of the dyspepsia in those patients in whom such a condition is found: is the dyspepsia due to a gastric neurosis or not?

Frequency. As will be seen from Table 1, 38 patients had earlier suffered from dyspepsia. Of these, 6 had had dyspepsia since childhood. In 32 patients dyspepsia had occurred later in life, the mean age of onset being 30·6 years. The first dyspepsia period of the remaining 12 patients merged without interruption into the ulcer period. The mean age at which duodenal ulcer was diagnosed was 39·0 years. (This finding is in contrast to the assertion that duodenal ulcer is a disease of comparatively young people, and is in accordance with the statistics reported by SMITH and RIVERS (1953). An interesting observation was that ulcer first appeared at about the same age in all the three different dyspepsia groups. Even if the vague point of time "from childhood" is fixed at as late as 15 years, the patients of this group have had periods of dyspepsia

for a period of at least 25 years prior to the ulcer. The 32 patients who suffered from dyspepsia later in life, had had intermittent dyspepsia for an average of 8·4 years before an ulcer was diagnosed.

The criteria employed to distinguish these periods of dyspepsia from periods of ulcer were the common clinical ones, viz. the nature and intensity of the pain and other clinical signs pointing to duodenal ulceration. In many cases the patient had been examined radiographically during a more than usually severe bout of dyspepsia. the radiological finding being negative with regard to ulcer and other structural

TABLE 2.—DYSPEPSIA AND CONFLICT PRECEDING THE FIRST DYSPEPSIA PERIOD IN THE 32 PATIENTS WITH INTERMITTENT DYSPEPSIA

Dyspepsia conflict discovered (In addition to the emotional conflict, physical factors such as heavy work, and war hardships were observed in 9 patients of this group.)	23
Dyspepsia conflict not discovered (Not identical with absence of emotional conflict)	9
Total	32

changes in the stomach and duodenum. It is possible, of course, that an ulcer or other visceral affection may have escaped detection. In this respect all clinical studies are open to criticism. It should be stressed, however, that the diagnosis of dyspepsia was in most cases made by specialists in internal medicine.

Neurotic character. The term "neurotic" has here been employed in its widest sense as a synonym for the equally ill-defined word "psychogenic". Because of the numerous investigations concerning the relationship of dyspepsia to emotional disturbances of different kinds, we did not focus our attention systematically upon the experiences of dyspepsia in association with "nervousness", trouble, and vexations. Nevertheless, a great many patients reported observations of epigastric distress in connection with such experiences. Hypothesizing that the 6 subjects with dyspepsia from childhood would react even to small deviations from the daily routine with epigastric symptoms, we focused our interest upon the first dyspepsia period in the 32 patients whose dyspepsia started later in life. The results are to be found in Table 2.

In 23 patients a circumscribed conflict could be observed. In content it resembled the pre-ulcer conflicts, though the number of severe hypochondriac conflicts was insignificant. Moreover, in 8 of these 23 patients, in addition to the emotional conflicts, physical factors such as heavy work and war hardship were to be found. In passing, it may be mentioned that heavy work and war hardships are never solely somatic processes but are strongly loaded with fears and aggressive feelings.

Failure to discover a dyspepsia-eliciting conflict does not, of course, mean that there was no emotional conflict as an etiological factor in these cases. An inadequate capacity for introspection and the long interval between the first period of dyspepsia

and the examination, may explain why no conflict could be found. On the basis of the results of this investigation it may be said that in a great number of cases of dyspepsia beginning at about 30 years of age, a distinct neurotic etiology could be traced. Later in life, these patients with a distinct conflict during the first dyspepsia period frequently reacted to minor troubles with epigastric distress.

Dyspeptic periods leading to ulcer

Frequency. It will be seen from Table 3 that the diagnosis of an ulcer was preceded

TABLE 3.—DYSPEPSIA PERIODS TERMINATING IN DIAGNOSIS OF DUODENAL ULCER

Dyspepsia period immediately prior to diagnosis of duodenal ulcer.	49
No dyspepsia period immediately prior to diagnosis of duodenal ulcer.	1
Total	50

by a dyspeptic period in 49 cases out of 50. In the single case in which ulcer was not immediately preceded by dyspepsia but was diagnosed after haematemesis in connection with heavy physical strain shortly after pneumonia, the history revealed several dyspeptic periods and a clear, severe acute conflict of the type "frustration of oral dependent needs" had been present for two months before haematemesis.

Dyspepsia period and duodenal ulcer pain. The observation of a dyspepsia period preceding the diagnosis of duodenal ulcer implies differentiation of dyspepsia from duodenal ulcer pain. The 37 patients with intermittent dyspepsia terminating in duodenal ulcer reported that the dyspepsia period began with similar epigastric distress like previous dyspepsia periods not leading to ulcer. During the two months before the diagnosis, they noticed that the pain changed in character. This change, which occurred not only in quality but also in intensity, brought the patient to the doctor. In the 12 patients without intermittent dyspepsia a similar two-phase development of the epigastric distress could be observed. These observations of a dyspepsia pain period gradually merging into a duodenal pain period can be interpreted as clinical evidence that duodenal ulcer arises from gastric neurosis.

Characteristics of the pre-ulcer conflict

Frequency. In all patients with pre-ulcer dyspepsia a pre-ulcer conflict was observed. As mentioned above, I am convinced that there was a severe pre-ulcer conflict in the only patient who developed his ulcer without an immediately preceding dyspepsia period. But he is not included in the group of ulcers associated with an emotional conflict, because I maintain that a conflict with associated dyspepsia must go on up to the diagnosis of ulcer before the assumption can be made with certainty that the ulcer is caused by an emotional conflict.

The results are seemingly in striking contrast to those of VAN BALEN and LINDEBOOM (1955), who found an emotional conflict in 54 out of 135 patients only. The present series, however, comprises duodenal ulcer alone and only 3 patients with haematemesis, while VAN BALEN and LINDEBOOM's investigations embraces both gastric and duodenal ulcer, with haematemesis in every case. It appears that heavy lifting or muscular exercise plays a role in the occurrence of the ulcer—8 patients stated that their ulcer pain was increased by heavy work. The assumption that muscular exercise may influence the occurrence of ulcer is supported by the observations that muscular exercise may cause gastric hyperfunction and acute ulcers (SELYE, 1950). This factor may be of greater importance in cases of massive haemorrhage which, in turn, might explain the discrepancy between the present findings and those of van Balen and Lindeboom.

TABLE 4.—PRE-ULCER CONFLICT GROUPS

Content of pre-ulcer conflict	Number
Sexuality and marriage	5
Illness and death	19
Material existence (loss of job or home, economic misery, difficulty in gaining livelihood, disablement)	17
Self-assertion in occupation and in relationship to other persons (the go-getter conflict)	8

The criticism will be made that the results indicating conflicts in 49 out of 50 cases seem to be "too good to be true". But, as will be put forward below, it depends to a high degree upon our taking into account the fear of disablement, serious illness, and death, which in many cases dominates the patient during the pre-ulcer period. This fear and its meaning to the patient has been neglected in many investigations which are focussed upon personality features and the external characteristics of a stressing situation.

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Content of the patients' pre-ulcer conflicts

A brief account of the contents of the pre-ulcer conflict of each patient is given below. The number of the conflict group refers to Table 4.

1. Printer's apprentice, 18. Heavy muscular work. Forced to carry out part of his foreman's work. Could not change work, neither able to go on at the present place of work. "When there was a better working period, my stomach was better, too". Passive personality. Conflict III. Occupational group III.

2. Shop-assistant, 54. Tried to perform too strenuous muscular work at his brother's villa during his holidays. Did not even get suitable or sufficient meals. Intensive go-getter. Passive personality. Conflict IV. Occupational group IV.

3. Chauffeur, 48. Long, heavy working days in his brother's firm. His wife dissatisfied with this state of affairs. The patient in turn unverbally aggressive towards his brother. Conscientious personality. Conflict III. Occupational group IV.

4. Salesman, 43. Failed in his work in his mother's firm. Had to pay a fine for drunkenness. Fear of a disabling injury to the back. Passive personality. Conflict IV. Occupational group II.

5. Saleswoman, 25. Overwhelming difficulties in her work. Cannot change her work owing to lack of training for any other work. Feared that dyspepsia was a disabling disease of the stomach. Conscientious personality. Conflict III. Occupational group II.

6. Tram conductor, 45. Patient somatically weak: scoliosis and kyphosis. Death of father-in-law and purchase of a flat of his own resulted in cardiac and gastric distress. The gastric disorder grew worse when the patient began to fear that it would make him incapable of work. Conscientious personality. Conflict III. Occupational group IV.

7. Refrigerator electrician, 31. Rheumatic heart disease. The firm on the verge of bankruptcy. Three weeks ago the other fitter found another job. The patient tried to find one, too, but failed.

Conscious of his disablement owing to the heart disease. Conscientious personality. Conflict III. Occupational group III.

8. Founder, 38. Failed repeatedly in efforts to rise socially. Must support wife's children from a former marriage. Wife ill during last half year. Go-getter personality. Conflict IV. Occupational group III.

9. Mechanic, 48. Trade-unionist. Conscious of responsibility. Gastric distress in connection with wage conflicts. Distress accentuated when the pain, which the patient had had for a number of years in the small of his back, grew worse. Cancerophobia in connection with the pain in the back and stomach. Conscientious personality. Conflict II. Occupational group III.

10. Female garden-hand, 41. Periodic gastric distress since 10 years ago. Fearing that her mother would die since care of the 80-year-old father would be beyond her strength. Had pneumonia 3 weeks prior to haematemesis. This patient was the only one whose ulcer was not immediately preceded by dyspepsia. Passive personality. Conflict III. Occupational group IV.

11. Telephone mechanic, 23. Aggressive towards wife who, contrary to their agreement, had taken to their home a second child from her earlier marriage. Patient feels he will not be able both to support the family and also save for a flat of his own. Passive personality. Conflict III. Occupational group III.

12. Engineer, 46. Responsible position in industry. Half a year before the ulcer the patient came under a new chief, who deprived him of his earlier independence. Severe conflicts with his chief. Go-getter personality. Conflict IV. Occupational group I.

13. Printing-worker, 50. Alcoholic. Fear of pulmonary cancer. Ten days before admission to hospital the patient had celebrated his fiftieth anniversary in the home of a friend since his wife did not allow him to celebrate it at home. Is now also having his dinners out. Passive personality. Conflict II. Occupational group III.

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14. Custom's officer, 38. Functional cardiac distress in connection with efforts to make a career for himself which excites the envy of his colleagues. Fear of sudden heart failure. Go-getter personality. Conflict II. Occupational group IV.

15. Female clerk, 25. Gastric distress began in 1952 with the discovery that her husband was unfaithful. She turned him out and he is now a sailor. "When the ship is down at the equator, I have no pain in my stomach but when it is nearing a Finnish harbour the pain sets in again". The dyspepsia which resulted in ulcer began when her brother complained about her and her children's having their meals at her mother's house. At this time her employer threatened to give her notice. Passive personality. Conflict III. Occupational group II.

16. Factory worker, 36. The pain in the stomach set in when the patient began doing heavy muscular work. It increased some months later when she was given still heavier work of a kind which male workers refused to do. Violent agressive feelings towards these male workers. Towards the end of the dyspepsia period pronounced cancerophobia. Industrious person. Conflict II. Occupational group V.

17. Custom House attendant, 26. Ambivalent attitude towards marriage. Scared of getting married and scared of loosing the girl he had kept company with. The girl tried to provoke a decision. "First money and a flat before one marries". Sensitive go-getter. Businessman along with his permanent work. Conflict I. Occupational group IV.

18. Precision mechanic, 32. Periods of dyspepsia for 3 years and simultaneously a marked hypochondriac neurotic trend. The pre-ulcerous dyspepsia began with dyspnoeic heart attacks which grew worse and worse. Conscientious personality. Conflict II. Occupational group II.

19. Seamstress, 54. Since 1949, rheumatoid arthritis. For half a year persistent rheumatic distress and a sedimentation rate of 35/-. For the last 3 to 4 months lived alone without her daughter, had meals in restaurants. Six years ago a doctor told her to have an annual radiographic check-up on her stomach because it looked as if she might get cancer of the stomach. She was very relieved when only ulcer was diagnosed. Industrious personality. Conflict II. Occupational group III.

20. Electric fitter, 26. For the last half year lived 38 km from his place of work. Cancerophobia in connection with increasing gastric distress. Passive personality. Conflict II. Occupational group III.

21. Commercial traveller, wife of building constructor, 45. Hard work. Severe hypochondriac reaction in connection with sudden death from heart failure of friend's husband. Go-getter personality. Conflict II. Occupational group II.

22. Welder, 40. Emotional reaction of long duration in connection with repayment of a debt. Aggressive because someone else did not repay a debt to the patient's wife. Ambivalent attitude to second wife whom he married 8 months ago. Conscientious personality. Conflict IV. Occupational group III.

23. Carpenter, 33. Prior to the ulcer the patient lost both his work and his flat. Boasting and presumptous. Below the surface clearly uncertain of himself. Passive personality. Conflict III. Occupational group III.

24. House painter, 40. Own painting and decorating firm, which is near bankruptcy. Increasing pain aggravated earlier cancerophobia. Pain and cancerophobia together caused a "feeling of being doomed to destruction". Go-getter personality. Conflict II. Occupational group III.

25. Electric fitter, 25. Hypochondria and marital conflict. Go-getter with primitive and intense emotions. Go-getter personality. Conflict II. Occupational group III.

26. Metal worker, 30. Does extra work as decorator. For some months unable to manage more than his ordinary job. Hypocondriachally afraid of severe somatic disease. Go-getter personality. Conflict II. Occupational group III.

27. Caretaker, 52. The patient, who brought up ten children and built himself a house, did not have pain in the stomach until ten months before the examination. At that time severe emotional conflict because son stole money (patient is caretaker of a bank!). Three months later ulcer, two months later renewed radiographic examination; ulcer healed. Three months later new ulcer. Patient unable to carry out the overtime work necessary to support the family. After non-dyspeptic period, a period of syspepsia dominated by hypochondriac fear which patient did not have before ulcer II. The last dyspepsia period ended with the diagnosis of ulcer (ulcer III). Conscientious personality. Conflict IV. Occupational group IV.

28. Cashier, 42. Patient kept company with "hopeless drunkard" who wants to marry her. Patient hesitates because mother against it. Supports both mother and the man who lost his job some months before her ulcer developed. Industrious personality. Conflict I. Occupational group II.

29. Bookbinder, 58. Works overtime to be able to support invalid sister. Severe cancerophobia in connection with appearance of pain even in the mornings. Conscientious personality. Conflict II. Occupational group IV.

30. Postman, 63. During the last two years twice heart infarction. Thrombangitis obliterans pain half a year before ulcer. During the same period increasing but light dyspeptic distress. Does not wish to be prematurely pensioned for ill health. Gastric pain during the last half year caused severe gastrointestinal cancerophobia. Go-getter personality. Conflict II. Occupational group IV.

31. Factory worker, 31. Skilled ambitious worker who has been the subject of envy on the part of her colleagues. At the same time dyspepsia set in. Engaged to a foreigner. Highly ambivalent attitude to marriage because of lack of sense of security. Before the examination, patient had already told fiancé that she was ill and that he should not get in touch with her. Conscientious personality. Conflict I. Occupational group IV.

32. Printing-worker, 39. Colleague tried to "elbow patient out" of firm. Conscientious, unverbal aggression. Capable individual with feelings of insufficiency. Conscientious personality. Conflict III. Occupational group III.

33. Night watchman, 32. Divorced about 3 years ago. Strenuous shift work. Six weeks before ulcer, fellow watchman committed suicide. Since that increasing hypochondria. Simultaneous conflict situation: to marry friend's widow or return to parents who, however, plan to sell home farm. Passive personality. Conflict I. Occupational group V.

34. Night watchman, 47. Reduced working capacity (70 per cent) because of reduced vision. Difficult to find work for last 2 years. One month before ulcer hurt his foot with axe. Got 10 days' sick leave only and had to return to work though foot still not healed. Aggressive towards doctor. Fears complete invalidity. Passive personality. Conflict III. Occupational group V.

35. Harbour worker, 56. Did not belong to same trade union as majority of fellow-workers. "When I did not go to my job, I had no pain in my stomach". Two months before the ulcer the conflict grew worse. Fellow-workers threateningly demanded that patient should leave his job which he had had for about 30 years. Aggressive, determined, not a go-getter. Conscientious personality. Conflict III. Occupational group IV.

36. Unemployed owing to heart disease, 53. Heart insufficiency, pulmonary emphysema, arterial

hypertension. Condition deteriorated two months before ulcer. Hypochondriac fear "that something new has happened in my chest". Conscientious personality. Conflict II. Occupational group V.

37. Engineer, 53. Responsible, difficult work for 2 to 3 months before ulcer. Two months ago patient's wife operated on for suspected abdominal tumour. Cancerophobia. Determined, self-restrained, conscientious. Conscientious personality. Conflict I. Occupational group II.

38. Hospital hand, 34. Conflict with immediate fellow-workers for 2 years. One year ago colleagues tried to get him dismissed. Severe cardiac neurosis. Strongly hypochondriac: fear of sudden death from heart failure, of brain tumour and psychosis. Labile, aggressive, sensitive. Passive personality. Conflict II. Occupational group V.

39. Female builder's worker, 37. During the last 2 years only periodically working. For the last half year worked only 3 weeks. During this time severe gastric pain. For some months before the ulcer, intense fear of cancer. Hard-working, self-restrained. Industrious personality. Conflict II. Occupational group V.

40. Restaurant hand, 40. Asthenic because of situs inversus, among other things. Apt to work more than physical capacity permits. Gastric pain aggravated by heavy muscular work one and a half months before ulcer. Feared that increased pain came from heart. Husband of patient's friend died of heart failure 3 months ago. Conscientious personality. Conflict II. Occupational group V.

41. Carpenter, 35. Lost his job 3 months ago. Fear of stomach cancer. Also fears that there is a tumour in the head "since there is often a feeling of weight over the eyes". Passive personality. Conflict III. Occupational group III.

42. Carpenter, 50. Nocturnal heart attack 10 weeks ago. At about the same time lifting of heavy objects caused pain. Unemployed for 2 months. Supports wife and three children. For a month fear of cancer. Asthenic, dependent tries to manage. Passive personality. Conflict III. Occupational group III.

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43. Factory worker, 42. Husband drinks. Patient supports husband and a son. Does heavy muscular work. Pain in shoulders and arms and simultaneous aggravation of gastric pain. Fear of cancer. Asthenic, aggressive, industrious. Conscientious personality. Conflict III. Occupational group V.

44. Unskilled labourer, caretaker in the evenings, 44. Female. For 2 years husband incapable of work because of phthisis. Two months before ulcer, husband's condition became worse and there was danger of infection of the children. Two months before ulcer, patient worked more heavily than usual. Industrious personality. Conflict III. Occupational group V.

45. Factory worker, 48. Seven years ago depressive psychosis with insomnia. Three years ago again sleepless, marked fear of repeated psychosis and hospitalization in a psychiatric clinic. Simultaneously ulcer I. Three months before ulcer II again sleepless. Also fear of cancer. Read in a medical book that ulcer may become malignant. Conscientious personality. Conflict II. Occupational group IV.

46. Designer, 31. For 4 months worked on difficult construction job. Long days and fear of failure. Dependent, passive personality. Forced mainly by external factors to high efficiency. Passive personality. Conflict IV. Occupational group II.

47. Janitor, 60. For 3 months lived under fear of dismissal. Advanced age and poor health make it hard to find a new job. When he suspected ulcer he began to fear that he would not survive operation since one of his fellow-workers had died on the table while being operated on for ulcer. Heavy work one month before ulcer. Passive personality. Conflict III. Occupational group V.

48. Engineer, 30. About 4 months ago became chief of department responsible for personnel and use of expensive machines. Conscientious personality. Conflict IV. Occupational group I.

49. Tailor, 44. Treated in a home for alcoholics. For a month, wife's rheumatoid arthritis getting worse. Patient ought to leave the institution where he has sought treatment voluntarily, in order to be able to support his 15 year old daughter. Passive personality. Conflict III. Occupational group III.

50. Telephone mechanic, 42. Ulcer twice before. Highly hypochondriac. Father-in-law operated on for ulcer and died of cancer. Fears that the same will happen to him. Two months before the ulcer, the gastric pain became worse. At this time stopped smoking out of fear of pulmonary cancer. "When the pain sets in, I get nervous and sweat breaks out on my forehead. Cancer is terrible and therefore I am always so pleased when I have had an X-ray". Conscientious, even small misfortunes in his work produce gastric pain. Passive personality. Conflict II. Occupational group III.

Analysis of contents of pre-ulcer conflicts

JASPERS (1953) considered that the commonest human conflicts may be divided as follows: 1. Sexuality; 2. Illness and death; 3. Material existence (own or that of the family); 4. Self-assertion in occupation or in relationship to other persons; 5. Religion; 6. Politics. SCHNEIDER (1955) called the guilt problem, illness and death, and fear of economic misery the "Urängste" of man. Of these conflicts the ulcer patients had neither guilt nor religious or political problems. Sexuality constituted a problem only in connection with marital troubles. The distribution of the other conflicts is seen in Table 4.

The pre-ulcer conflict is regarded as that conflict which, in the period preceding the appearance of the ulcer, appeared as a new conflict, or the conflict which was particularly accentuated. Several conflicts could naturally occur simultaneously. In such cases the conflict which was dynamically the most important is selected for inclusion in the table. Moreover, the same conflict may belong to more than one group. Thus fear of illness and death may also be fear of disablement and of economic misery. In these cases, the conflict which constituted the "straw that broke the camel's back" was considered to be the pre-ulcer conflict.

Meaning of the conflict to the patient

"There is nothing specific about the social situation which so frequently precedes the precipation of the syndrome. The only inference that can be made is that it is the specific meaning of the environmental event to the particular individual that determines whether or not the event is responded to as if it were a noxious one". (MIRSKY, 1958). Thus the investigation of the meaning of a stressful event is the most important aspect of psychosomatic research. In this study the most important characteristic of the conflict which led to ulcer proved to be the fact that it was experienced by the patient as *existential*, i.e. the patient felt that his existence, his life and his future were dependent on a positive solution of the conflict. (Thus defined "existential" does not refer to the meaning of the concept in current existential philosophy).

GOLDSTEIN'S (1947) definition of anxiety is in agreement with designating a conflict as existential: "Anxiety corresponds on the subjective side to a condition in which the organism's existence is in danger. Anxiety is the subjective experience of that danger to existence". In distinguishing between "stress" and "distress", QUERIDO (1959) is thinking along the same lines. To him "distress" implies social and psychic tensions too heavy for the patient to bear, while "stress" refers to tensions which are satisfactorily integrated in the patient's life-pattern. When emphasizing the different responses to severe external events, GRACE, WOLF and WOLFF (1951) cite the adage: "One man's meat is another man's poison".

Attitude to the conflict.

Another characteristic was that the patient felt his conflict so intensely that he *feared* that it was insoluble. In all patients fear was observed to be the predominating attitude to the conflict. Although he feared that the conflict was insoluble, he fought against succumbing to the threat that the conflict constituted. This *fighting attitude* which, according to GRAY, WOLF and WOLFF (1947), is characteristic of gastric hyperfunction, could be clearly observed in the patients, irrespective of their type of personality. One might say that a fighting fear was more evident than

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a fighting aggressiveness. Only in 32 patients could frank aggressiveness be observed alongside the fear. There is reason to believe, however, that a combination of fear and aggressiveness is particularly dangerous, since "fighting" always contains a certain aggressive component. The term "fighting" also indicates that the patient's attitude is not an attitude of yielding depression nor one of sudden fear and anxiety. The common duration of the pre-ulcer conflict comprising in most cases 10–60 days (see below) is in accordance with the hypothesis of fighting and excludes sudden anxiety reactions. Moreover our observations are in conformity with MAHL's (1949) assumption that it is chronic anxiety, and not acute anxiety, that gives rise to pathological gastric hyperfunction.

The time of onset of the pre-ulcer conflict

VAN BALEN and LINDEBOOM (1955) stated that in those cases in which massive gastric haemorrhage followed upon an emotional conflict, this conflict, as a rule,

TABLE 5.—DURATION OF PRE-ULCER CONFLICT PERIOD

Number of patients	Number of patients with pre-ulcer conflict	Duration of pre-ulcer conflict period			
		<10 days	<3 months	<1 year	<1 year
50	49	1	42	5	1

occurred during the 3 months before the ulcer was diagnosed. The duration of the pre-ulcer conflict in the present series will be seen from Table 5.

One point should be particularly emphasized in this connection: the above statements on the duration of the pre-ulcer conflict do not mean that the patients only had dyspepsia of emotional origin during this time. As was already pointed out, only the conflicts which immediately preceded the diagnosis of the ulcer and which appeared simultaneously with pains of ulcer type are here called *pre-ulcer* conflicts.

Course

There were two courses. In one, the pre-ulcer conflict period and the ulcer pain were preceded by dyspepsia caused by *another* conflict which clearly, though gradually, merged into the pre-ulcer period. It is this addition of a new conflict (the pre-ulcer conflict) to an earlier conflict (the dyspepsia conflict) which is in many cases characteristic of the situation which, in the organism, not only causes hypersecretion and other functional disturbances but also gives rise to a tissue defect, i.e. ulcer.

The second course of development, i.e. that for some reason or other the same dyspepsia conflict increased in intensity and range was also common.

Occupational groups and pre-ulcer conflict

Table 6 gives the correlation between occupational groups and pre-ulcer conflicts. Owing to the smallness of the sub-groups, the only significant observation which can be made is the absence of a "go-getter" conflict in occupational group I. The municipal character of the hospital does not allow any inference as to the prevalence of duodenal ulcers in different occupational groups.

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TABLE 6.—OCCUPATIONAL GROUP AND PRE-ULCER CONFLICT

Occupational group	Pre-ulcer conflict group				Totals
	I	II	III	IV	
I	—	—	—	2	2
II	2	2	2	3	9
III	—	8	7	2	17
IV	2	4	4	1	11
V	1	5	4	—	10
Totals	5	19	17	8	49

Reciprocal effect of personality and conflict

The present study was primarily concerned with the pre-ulcer conflict and not with the relative significance of the personality. Only one aspect of it was specially investigated. WEISMAN (1956) suggests that the nuclear conflict of the patient with duodenal ulcer is between active seeking and passive yielding and that the conflict relating to oral dependent wishes is a special aspect of the passivity-activity conflict. This hypothesis seems to be only a paraphrasing although a fruitful paraphrasing, of Alexander's widely known hypothesis. It focusses attention upon active and passive character traits. When classifying the 50 ulcer patients according to this personality dimension, four groups were readily discernible, Table 7.

The method used by us was similar to that employed in the sociological attitude investigation. The personality trait or attitude was determined on the basis of answers given to questions all of which were put to every patient. Data obtained in taking the case history were also used. The definitions given by us are to be considered *operational*. By that is meant that we have classified as "passive" the patient who does not work hard without external pressure, who does not make over-ambitious attempts at a social rise or to obtain or create something (e.g. money, house, invention), who is not motivated by a sense of duty (see Table 7). The "go-getter", the "conscientious", and the "industrious" are all hard-working but differ from each other in respect to the incentive for working hard. The "go-getter" is bent on gaining social recognition, the conscientious patient is working hard out of a sense of duty, the industrious subject having none of these motives is working hard seemingly out of a "normal" love of work.

Among the patients there were representatives of the whole activity-passivity scale, and the

TABLE 7.—DIFFERENTION ACCORDING TO ACTIVE-PASSIVE PERSONALITY TRAITS

Personality trait (attitude)		Total	Working hard without external pressure	Attempt at social rise or to obtain or create something	Sense of duty	Spontaneous love of work
Passive		18	—	—	—	—
Active	Go-getter	9	+	+	—	—
	Conscientious	18	+	—	+	—
	Industrious	5	+	—	—	+

relatively small number of "go-getters" is perhaps to be related to the under-representation of the higher occupational classes due to the municipal character of the hospitals in which the study was carried out. Without investigating a normal control series, nothing can be said about the prevalence of any character group. However, the small number of industrious subjects is suggestive.

The relationship between character trait (activity-passivity) and type of pre-ulcer conflict is presented in Table 8. The findings to be emphasized are as follows: The type of conflict was not clearly correlated with any special character type. Among the passive subjects there were a few who due to environmental stress strove after success

TABLE 8.—PERSONALITY GROUP AND PRE-ULCER CONFLICT

Personality group	Pre-ulcer conflict				Totals
	I	II	III	IV	
Passive	1	4	9	3	17
Go-getter	1	6	—	2	9
Conscientious	2	6	7	3	18
Industrious	1	3	1	—	5
Totals	5	19	17	8	49

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in social or financial career (go-getter conflict). In a surprising number of cases the go-getter's pre-ulcer conflict was related to illness and death (apparently because of the threat not only to physical existence but also to social success).

DISCUSSION

Controls

In discussing the control group in therapeutic trials, HERDAN (1955) takes the view that only with acute diseases is it possible to obtain a homogeneous group suitable for comparison. Chronic diseases, on the other hand, become increasingly individualised the longer they last; that is, they become part of the individual, which makes it very difficult to collect a sufficient number of even approximately similar cases. For this reason HERDAN compares different periods in the patient's life, which means that the patient himself is his own control.

HERDAN's view is mentioned here only in order to make clear that there are more problems in establishing a control group than the mere collection of a random group of subjects without the symptom under investigation. If in our investigation the task had been to prove or disprove the supposition that the ulcer patient has a specific personality make-up, the only way would have been to compare a group of ulcer patients with a random group of non-ulcer subjects matched as regards age, sex and social status. But this was not the case. Our investigation started from the assumption that adequate evidence had already accrued that duodenal ulcer will develop preferably in individuals with specific physiological and psychological traits (MIRSKY, 1958; WRETMARK, 1953; HÖJER-PEDERSEN, 1958). Our main task was therefore to investigate whether in the pre-ulcer period those individuals who

are more or less predisposed to ulcer must become involved in a specific situation before the ulcer is manifested. Hence the only possible comparison is between the ulcer period and the non-ulcer period of the patient, i.e. the patient has to provide his own control. This is what has been done in the investigation here presented. However, there may be an approximation to a relevant control group made up by other subjects. Because the majority of our patients had suffered from chronic dyspepsia for many years a hypothesis may be put forward to the effect that a chronic dyspepsia patient is an individual who has not yet developed an ulcer because he has not yet been subjected to a degree of stress sufficient for a "existential conflict" to ensue. On the other hand investigations have been reported according to which the personality make-up of at least some chronic dyspepsia patients differs from that of ulcer patients. This can be interpreted as evidence for the assumption that the chronic dyspepsia group is not homogeneous. Some chronic dyspepsia patients obviously have a predisposition to duodenal ulcer. In others of the chronic dyspepsia group this disposition seems to be absent. There is a need for further investigation of the relationship between chronic dyspepsia and duodenal ulcer from the psychosomatic point of view.

Another difficulty inherent in the investigation of control groups is a methodological one. With the psychiatric interview method patients with severe anxiety reveal facts in quite a different way than healthy controls or patients with a negligible amount of anxiety. The correct interpretation of not finding "existential conflicts" in these controls may be that the control subjects do not render themselves amenable to investigation by the psychiatric interview method.

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FINDINGS

The chief result shows that in addition to constitutional physiological factors and psychological character traits, the development of a duodenal ulcer requires a specific situation called by us the "existential conflict". This finding can be interpreted as additional corroboration for the concept of duodenal ulcer as a disease of emotional origin. Another interesting feature of the study was the demonstration of the frequent existence of a gastric neurosis for many years before the development of the ulcer. The personality and the acute conflict contribute to the development of the ulcer to a varying degree. The almost regular discovery of a severe emotional conflict influencing the patient at the time of the diagnosis, and the high mean age (39·0 years) on getting the first attack of ulcer seem to indicate that the premorbid personality cannot be the sole pathogenic factor. No doubt each personality is apt to develop his own emotional conflict. On the other hand, an illness and threat of death come to an individual irrespective of his personality. Economic penury does not always depend upon personality traits. The same is partly true of marital conflicts. The gradually increasing emotional tension, frequently due to a conflict (the pre-ulcer conflict, in many cases superimposed on a dyspepsia conflict) was almost invariably observed during the three months preceding the diagnosis of ulcer. This finding strongly supports MAHL's (1940) view that *chronic* anxiety is the dominating emotion "causing" gastric hyperfunction and duodenal ulcer. On the other hand, our observations concerning the *content* of this pre-ulcer conflict which produces chronic anxiety are strongly in favour of ALEXANDER's (1952) hypothesis of frustration of oral needs or of WEISMAN's (1956) more generic formulation, according to which the conflict is between active seeking and passive yielding. The activity-passivity conflict is at the same time

the biological "conflict" between the need of function or work, on the one hand, and the need of relaxation or rest, on the other.

Obviously owing to differences in social position and way of thinking and living, the conflict in our patient series is not often the "go-getter" conflict. We name the pre-ulcer conflicts '*existential*' because illness, death, disablement, and economic penury touch the very basis of the human existence. Without allotting any scientific significance to the thought, it is difficult in this context, to refrain from thinking of Freud's view on the struggle between life instincts and death instincts. Our observation of the *fighting attitude* (GRAY, WOLF and WOLFF, 1951) as a condition for the development of a duodenal ulcer, involves serious and prolonged attempts to overcome the threat inherent in the existential conflicts. In this respect, duodenal ulcer seems to differ from many an acute anxiety neurosis mainly characterized by heart symptoms.

There are two investigations making a sociological approach to duodenal ulcer which can be mentioned as evidence of the significance of the "existential" conflict. In a study of 45 patients PFLANZ, ROSENSTEIN and UEXKULL (1956) found a coincidence between duodenal ulcer and isolation from a community experienced as secure and protective. The social isolation occurred in almost all patients within eight days to two months before the onset of ulcer symptoms. SIURALA and TÄHKÄ (1953) found the frequency of peptic ulcers in a Prison Hospital greater than that in a Military Hospital as compared with the other internal diseases treated in the two hospitals. The findings can be interpreted as evidence for the assumption that external situations which are a threat to existence favour the development of duodenal ulcer.

Since the completion of this investigation, the investigation of WIECK *et al.* (1959) has appeared. 100 ulcer patients were compared with 100 controls without ulcer. No significant difference was found in the frequency of conflicts between the two patient series; there was also no significant difference between ulcer and non-ulcer patients as to the degree of "strongness" in the experience of the conflict. WIECK *et al.* as a result of their findings, consider that there is no empirical basis for the assumption of a psychic genesis of peptic ulcer.

However, the investigation made by WIECK *et al.* is not convincing, because it is not the external, psychosocial conflict as such which has the pathogenic effect. The meaning of the conflict (MIRSKY, 1958) is the crucial point. At one extreme, there is the person to whom the death of his mother is a slight, passing experience, and at the other, the person who in the same situation, feels his life, his entire existence, threatened by the loss. A vague assessment of "strongness" made by WIECK *et al.* does not suffice. The significance of the conflict as an existential threat has to be evaluated.

A second criticism of the work of WIECK *et al.* is related to the question of controls. It is not maintained that emotional conflicts are less frequent in other groups of human beings. Instead it is considered that in *properly predisposed* subjects emotional conflicts of sufficient intensity and duration are an almost constant contributory factor. Inferences made on control series of subjects with no predisposition are not relevant.

SUMMARY

1. 50 unselected patients with duodenal ulcer were studied. The investigation was focused upon the existence of a conflict preceding the diagnosis of a duodenal ulcer (pre-ulcer conflict), and the relationship of duodenal ulcer to gastric neurosis and the patient's personality.

2. In 49 patients gastric dyspepsia was found which merged imperceptibly into the ulcer pain period. In a number of cases the intermittent gastric dyspepsia proved to be a gastric neurosis.

3. A severe conflict preceded the diagnosis of duodenal ulcer. In most cases the conflict started not more than three months prior to the establishment of the diagnosis. In many cases this pre-ulcer conflict was superimposed upon an already existing conflict, changing the gastric dyspepsia into a duodenal ulcer.

4. The character of the pre-ulcer conflict was "existential", i.e. it was experienced as a threat to the patient's very existence. (Without having the life-threatening implications of the term "existential", the concept "oral" partly overlaps it; both refer to the basic condition of life.) In a remarkable number of cases, exaggerated fear of illness and death was the most anxiety-producing conflict ("hypochondriac conflict").

5. In all cases, chronic anxiety (MAHL) was observed to be closely related to the development of duodenal ulcer. Frustration of oral needs (ALEXANDER) was the source of this chronic anxiety. A third characteristic trait was the patient's fight (GRAY, WOLF and WOLFF 1951) against the frustration.

6. A reciprocal relation is suggested between the pre-ulcer conflict and the personality. Specific personality traits almost coerce the subject into life situations which bring about the course of events leading to duodenal ulcer. On the other hand, severe external life situations outside the patient's control can produce similar disturbances in an individual who is to be considered normal. The "passive", the "go-getter", and the "conscientious" personalities were found to be particularly prone to duodenal ulcer.

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EXPERIMENTAL PRODUCTION AND CONTROL OF STOMACH LESIONS IN THE RAT

J. O. SINES*

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SEVERAL recent reports have indicated that gastric ulcers and severe stomach lesions can be produced in the rat by means of psychological stress (approach-avoidance conflict) (SAWREY and WEISZ, 1956; SAWREY, CONGER and TURRELL, 1956), and immobilization (SINES, 1959). One of these reports (SINES, 1959) further demonstrated that there is a significant genetic factor in the susceptibility to stress-induced stomach lesions. The physiological mechanisms underlying development of such lesions in the rat have not been examined, nor are there data relative to the pharmacologic control of lesion development in this species. One approach to the latter question involves the study of the effects of drugs known to be parasympathetic blocking agents. The present report deals with the incidence and severity of immobilization-produced stomach lesions in normal and lesion-susceptible rats after treatment with several anticholinergic compounds† and a major tranquilizer.

STUDY I

Subjects

Forty-eight male albino rats 80–90 days of age were used. All were descendants of Holtzman Sprague–Dawley albinos which had been born and raised in this laboratory. The group from which the animals in the first study were drawn was the F_3 generation of lesion-susceptible animals, all of which developed stomach lesions following 24 hours of immobilization (SINES, 1959). Before this study all the subjects had been maintained on standard laboratory regime which involved group housing and *ad lib* food and water. Table I indicates the number of subjects in each sub-group in the first study.

Stress technique, medication and stomach evaluation

Stomach lesions were produced by immobilization which consisted of wrapping each animal in a plaster of paris cocoon. After 24 hr of immobilization all animals were sacrificed with ether and the stomachs were inspected for lesions. Lesions were rated 0 to 4 depending upon their severity, with 0 indicating a normal stomach; "1" small petechiae; "2" irregularity of the mucosal lining; "3" a clearly defined defect which usually involved bleeding; and "4" the most severe lesion observed, being a palpable defect which almost invariably included considerable congealed blood in the base of the crater.

* From the Washington University School of Medicine.

† Drugs used were generously provided by: Pro-Banthine, Searle; Atrenyl, Ciba; Darbid, Smith Kline and French. The brand names of the several drugs are registered by the respective manufacturers.

One and one-half hr before, and 3 hr after, immobilization 0·45 mg/kg of Pro-Banthine, 0·33 mg/kg of Antrenyl and 10 mg/kg of chlorpromazine were administered to each animal in the appropriate groups. Three hours before and 6 hr after immobilization subjects in another group were given 0·16 mg/kg of Darbid. All drugs were given in 0·1 to 0·2 cc saline solutions. The anticholinergics were administered subcutaneously and chlorpromazine was given intraperitoneally before immobilization and by stomach tube after it.

The doses of the anticholinergic drugs used were approximately equivalent to twice

TABLE 1.—INCIDENCE AND SEVERITY OF STOMACH LESIONS IN UNTREATED, ANTICHOLINERGIC TREATED AND CHLORPROMAZINE TREATED RATS FOLLOWING 24 HOURS OF IMMOBILIZATION

	Untreated	Probanthine 0·45 mg/kg	Antrenyl 0·33 mg/kg	Darbid 0·16 mg/kg	Chlorpromazine 10 mg/kg
Severity	*N*	*N*	*N*	*N*	*N*
4	10	—	—	4	10
3	2	—	2	1	—
2	2	1	3	1	—
1	—	1	1	3	—
0	—	4	3	—	—
Number of animals in each group	14	6	9	9	10

Anticholinergic Drug vs.	"U" =	1·0	9·0	45
Control	*P* =	0·001	0·001	0·05
Anticholinergic Drug vs.	"U" =	0	0	15
Chlorpromazine	*P* =	0·001	0·001	0·01

the recommended initial doses with humans, prorated on the basis of each animal's body weight; the injection times reflected the effective periods noted for each drug in the manufacturers' literature. The dose level of chlorpromazine was one which in our experience significantly reduced both activity and learning rate and further, produced gross behavioural changes lasting for approximately 4 hr.

RESULTS

Table 1 summarizes the data regarding incidence and severity of lesions in the various groups in the first study. The statistic used was the Mann-Whitney "U" and each anticholinergic treated group was compared separately to the control and chlorpromazine treated animals. These results indicate that treatment with the anticholinergic compounds employed tended to reduce severity and incidence of immobilization-produced stomach lesions although not all of the drugs or doses employed were

equally effective in this respect. Furthermore, chlorpromazine appeared to increase incidence and severity of immobilization-produced stomach lesions if, indeed, it had any effect at all. This last finding led to the second study, designed to examine the effect of chlorpromazine on immobilization-produced stomach lesions in a more lesion-resistant group of animals.

STUDY II

Stress, medication and stomach evaluation

In view of the unexpected effect of chlorpromazine on severity of lesions noted in lesion-susceptible rats following 24 hr of plaster-cast immobilization, 2 groups of stock

TABLE 2.—INCIDENCE AND SEVERITY OF STOMACH LESIONS IN SPRAGUE-DAWLEY RATS SUBJECTED TO RELATIVE IMMOBILIZATION FOR 12 HR WITH AND WITHOUT CHLORPROMAZINE

Lesion severity	Non-medicated	Chlorpromazine treated
4	0	0
3	0	3
2	0	4
1	2	4
0	8	5
	Number of animals 10	Number of animals 16

$x^2 = 5{\cdot}85$ (calculated from 2×2 table, lesion, no lesion *vs* drug, no drug); one-tailed $P = 0{\cdot}01$.

animals were subjected to a less severe stress experience. This second stress situation involved relative immobilization for 12 hr in a confining wire enclosure which prevented the animals from moving in any direction but was not as closely form-fitting as the plaster of paris cocoons. We had previously found that only a small percentage of our Sprague-Dawley stock animals developed lesions, usually mild, after 12 hr in the wire mesh enclosure. Two groups of 80–90 days old male Sprague-Dawley rats, one group non-medicated (10 animals) and another treated with 10 mg/kg of chlorpromazine intraperitoneally (16 animals) 1½ hr before and 3 hr after immobilization were placed in the wire mesh containers for 12 hr, after which all animals were sacrificed and the stomachs were evaluated as previously described.

RESULTS

The results of the second study, summarized in Table 2, indicate that two 10 mg/kg doses of chlorpromazine, administered 4½ hr apart, are related to development of stomach lesions in a significantly greater proportion of Sprague-Dawley rats than is found in a group of animals not so treated but subjected to an identical amount of stress.

CONCLUSION

Immobilization-produced stomach lesions in susceptible rats can be controlled by means of several anticholinergic compounds but larger doses of chlorpromazine tend to increase both severity and incidence of such lesions. The effect of the anticholinergic

agents suggests that stomach lesion development in the rat is at least in part dependent upon parasympathetic hyperactivity. Rats which are highly susceptible to stomach lesion development following stress would thus seem to be convenient and valid subjects for the screening of anticholinergic compounds. Although an atropine-like effect on volume of gastric secretion in man has been noted by HAVERBACK, STEVENSON and SJOERDSMA (1955), HALEY, MCCORMICK and MCCULLOH (1955) have found that the effect of chlorpromazine in prolonging survival time in irradiated mice occurred *at a low dose level only* (5 mg/kg). The present findings relative to the effect of chlorpromazine (two 10 mg/kg doses within 5 hr) on stomach lesion development may thus reflect the detrimental influence of higher doses of the drug on another type of stress tolerance.

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A METHOD FOR THE OBJECTIVE DENOTATION OF THE SOUND OF THE HUMAN VOICE

P. F. OSTWALD*

(*Received* 4 *January* 1960)

THE nonverbal characteristics of speech are of importance in the investigation of human communication. Rate and rhythm of word utterance, for example, provide listeners with clues of the alertness and mood of the speaker (PITTENGER and SMITH, 1957). Stress and inflection patterns give information on the way a speaker's words are to be interpreted. The sound of the speaker's voice is another dimension of verbal behaviour. The purpose of this report is to describe a method for denoting the sound of the voice in objective visual terms.

The human voice is a complex sound, which, like the sound of a musical instrument, consists of a fundamental tone and numerous harmonics (HELMHOLTZ, 1954). While the exact mechanism of voice production is not yet fully understood, there is fairly general agreement among phoneticians that overlapping physiological processes are involved. The central nervous system controls movements of the lungs, larynx, and mouth, which form and shape the voice. Resonating chambers like the chest, throat, and skull modify the voice in terms of its frequency-intensity characteristics. Feedback of information from the speaker's ears and from outside listeners further determines what is said and how it is said, in particular in regard to those vocal utterances which we call words. One expects, therefore, that the sound of the voice will vary from one speaker to the next depending on his body build, the integrity of the various organs involved in voice production, the emotional and physiological fluctuations which affect these organs, and the demands of the external environment.

Correlations between the voice and other components of human behaviour have been attempted with varying degrees of success since ancient times, when off-stage voices were used to portray different personages in plays and pageants (OSTWALD). Several studies have appeared showing how voices may be correlated with body build, sex, age, occupation, and other personal characteristics of speakers (LICKLIDER and MILLER, 1951). There is also some evidence that changes in the sound of the voice correlate with situational characteristics such as truth-telling, expression of emotion, and social attitudes (LICKLIDER and MILLER, 1951). Such studies are of great importance for psychotherapists, singing teachers, speech correctionists, and other professionals who evaluate vocal behaviour and train people to use their voices more effectively.

Scientific investigation of the human voice as it is used in speaking must take into account the fact that no clear-cut distinction can be made between voice and speech. When a person speaks he produces a series of sounds which carry acoustic energy in the frequency range between approximately 100 and 6000 c/s. At several points along this spectrum, the sounds of his voice reach levels of concentration, called formants. According to LIBERMAN and his co-workers at the Haskins Laboratory, definable interrelationships over time between several formants account for the appearance of phonemes, which are recognizable speech sounds like vowels and consonants (LIBERMAN, 1957) It follows therefore that to denote the sound of the human voice as it actually occurs in speaking, one must include all of its acoustic components. Isolation of one energy level, for example the fundamental pitch, would ignore many of the acoustic cues which provide intelligibility and give a voice its individual and distinctive flavour.

The method described here for denoting the sound of the voice reduces all sounds emitted by the speaker to a meaningless noise, thus eliminating any possible distinctions

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between his voice and his speech. A tape-recording is made in an echo-free environment. An omnidirectional microphone (Electrovoice Model 655C) placed horizontally in front of the speaker's mouth at a distance of 10 inches has been used. The subject is asked to read a brief standard paragraph, and after a warming up period this is recorded with a magnetic tape-recorder (Ampex Model 601). Immediately after the reading, a 1000 cycle calibrating tone is recorded on the same tape. A 4-foot loop is

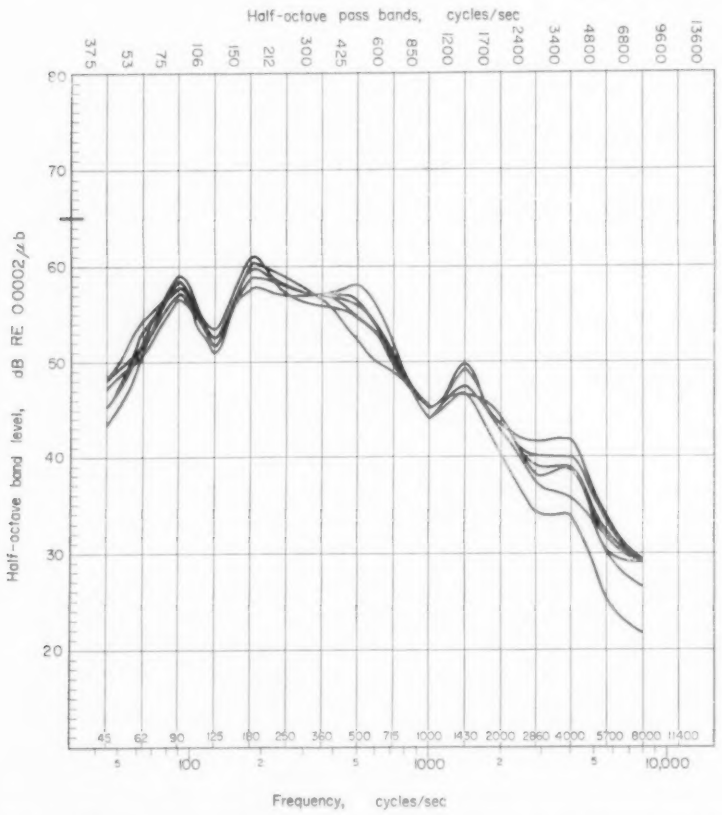

FIG. 1.—Six analyses of the voice of a 27-year old depressed man, showing little variation from one week to the next, and poor distinction between the middle formants, possibly accounting for the indistinct quality of his speech.

made from approximately the first two sentences of the tape-recorded speech. This is played backwards through a Sound Analyzer (H. H. Scott Model 420-A), the pre-recorded calibrating tone having been used to adjust the analyzer to a base level. The operator of the sound-analyzer hears only a meaningless jumble of noise and, undistracted by meaning and other verbal cues, records the absolute sound level and the distribution of sound energy in half-octave bands. After relatively little experience with acoustical instruments it is possible to repeat the readings in this way with a very high degree of accuracy.

The result of each sound analysis is plotted on prepared graph paper with frequency in c/s as the abscissa and half-octave band level in decibels re 0·0002

microbar as the ordinate. Each voice is thus denoted in the form of a graph, and, by equating the absolute sound levels of the various sound analyses, the graphs can be superimposed for comparison. Fig. 1 shows the results of repeated weekly analyses of the voice of a 27-year old man suffering from a psychoneurosis with depression. His voice was weak, muffled, and lustreless. The analyses, which vary little from one week to the next, show the first formant concentration at 90 c/s, and relatively

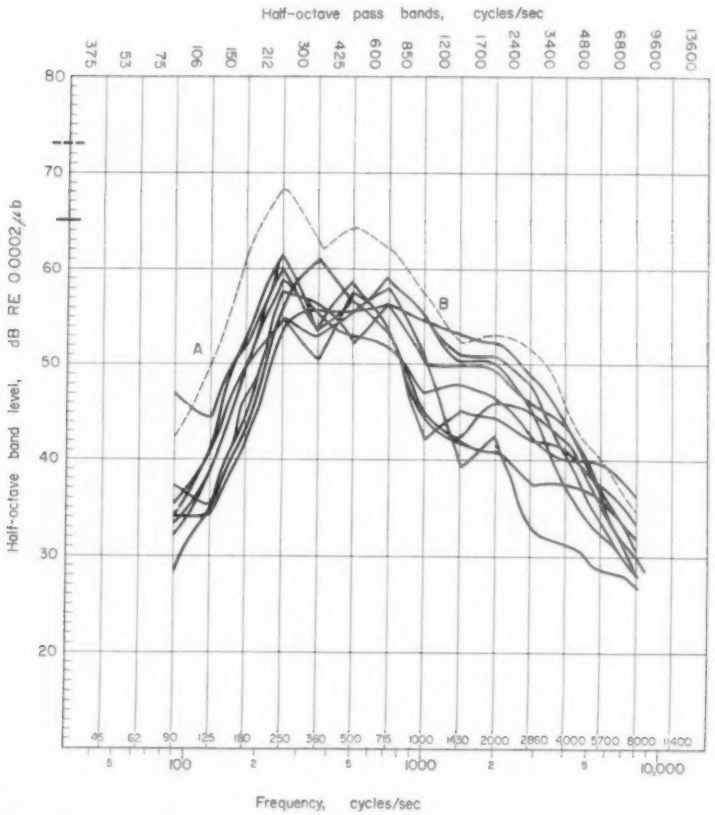

FIG. 2.—Weekly analyses of the voice of a 22-year old hysterical woman in psychotherapy, showing a basic pattern resembling that of a 10-year old child (AB) and irregularities which probably represent her dramatic use of the voice.

little differentiation between the second and third formants, which may account for the indistinctness of his speech.

Fig. 2 shows 9 weekly sound analyses of the voice of a 22-year old woman with hysterical and psychosomatic symptomatology. The graphs, made from recordings taken directly during psychotherapeutic interviews, demonstrate how the personality-bound characteristics of the voice overlap with its situational characteristics. There is a regular pattern, resembling the voice of a 10-year old child, which is reproduced for comparison at a level 8 db above the other curves. This denotes the pinched, childish, immature quality of the patient's voice. The irregular patterns which

fluctuate from one week to the next denote her hysterical, screechy, demanding way of speaking, and her use of the voice as a means of attracting attention and evoking sympathy.

Fig. 3 presents sound analyses of 4 different patients. The heavy curves represent the voices of 3 senile men. The tell-tale feebleness and quakiness of their voice is apparent: there is a rapid falling off in acoustic power above 200 cycles. It is not yet

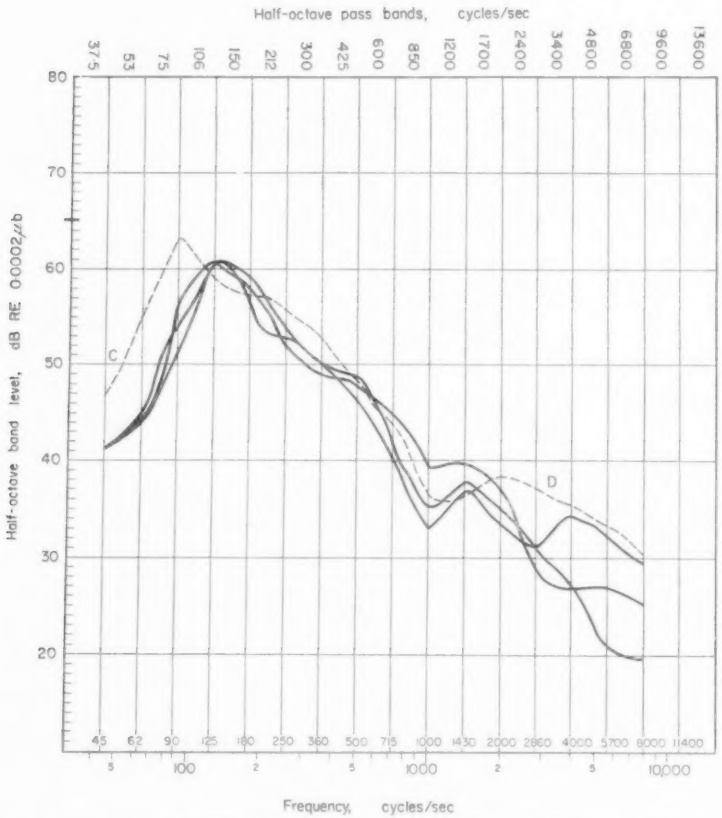

FIG. 3.—Analyses of the voices of 4 organically impaired males, showing a drop in acoustic energy above 200 cycles per second. The heavy curves are from 3 senile patients. The dotted curve (CD) is from a young man with bilateral frontal lobe damage.

known whether this characteristic results from a diminished elasticity of the speech organs of old people, or whether it is a function of disturbed cortical control of speech. That the latter may be a factor is suggested by the similarity between the shapes of these curves and the record of a physically robust 20-year old man who sustained bilateral frontal-lobe damage in a motorcycle accident (dotted curve CD).

The method lends itself to the investigation of the voice in the fields of neurology, psychiatry, and phoniatrics. It may also be applicable to comparative linguistics, noise control, and related fields of communication research. The sound of the voice is, however, only one dimension of verbal behaviour; the above method for denoting the

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sound of the voice is objective, simple, and relatively inexpensive but it cannot be used as a research tool in the absence of other diagnostic methods applicable to human behaviour.

SUMMARY

By playing tape-recorded speech backwards through an acoustic analyzer, graphs are obtained which display frequency vs. sound energy per half octave band. This method makes no distinction between voice and speech. It is used to study psychiatric patients and may be applicable to other problems in behavioural research.

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NOTICE

SOCIETE FRANCAISE DE MEDECINE PSYCHOSOMATIQUE

Résumés des communications présentées au cours de la séance du 4 février 1960

DR. MICHEL FONTAINE and Dr. L. CHERTOK: **Pathologie psychosomatique chez les animaux domestiques.**

Un aspect psychosomatique des affections spontanées des animaux domestiques peut être parfois envisagé. Les faits évoqués ici peuvent constituer une introduction à une étude orientée dans ce sens: il s'agit en particulier des épilepsies de groups, des affections d'allure hystérique, des névroses postémotionnelles. Une discussion est ouverte sur la participation psychique éventuelle dans le développement des diverses affections métaboliques et endocriniennes, génitales et urinaires, nerveuses et musculaires, digestives et respiratoires. La thérapeutique permet aussi de croire à la réalité d'une médecine psychosomatique vétérinaire.

CL. LEROY, P. NOEL, G. BENOIT, P. BARDIN. **Effect de la stimulation lumineuse intermittente sur un rythmé cardiaque pathologique avec extrasystoles.**

LES auteurs rapportent l'observation d'un épileptique avec myoclonies qui présentait un rythme cardiaque lent avec bigéminisme de temps à autre.

Ils montrent que ce sujet, malgré un EEG normal, placé sous stimulation lumineuse intermittente avait des modifications de ses extrasystoles et de ses myoclonies, en fonction de la fréquence de la stimulation lumineuse utilisée. Bien que cette action soit faible, ils en concluent à l'influence du système nerveux central sur ces extrasystoles ventriculaires.

Rapprochant cette observation d'autres ils mettent en évidence la possibilité d'envisager l'action des stimulations dans les affections psychosomatiques à l'aide de la théorie de l'information, de l'histoire du sujet, de l'état de son organisme et de ses modes de réaction dans une attitude phénoménologique.

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